
Ecological Impact Assessment

Sesswick Way, Wrexham

for

Low Carbon Farming 2 Ltd.

28 August 2020



Client

Low Carbon Farming 2 Ltd.

Planning authority

Wrexham County Borough Council

Time limit of reliance

Please note that the reported surveys were conducted on the date(s) stated in the report and that it represents site conditions at the time of the visit. The findings and recommended mitigation are based on these conditions. If site conditions change materially after the site survey, the original report cannot be relied upon and will need to be updated. Ecological reports and surveys can typically be relied on for 18 to 24 months from the date of survey.

Surveys supporting European Protected Species Mitigation Licence applications must be within the current or most recent survey season for bats (May to September), or within two survey seasons for great crested newts (March to June).

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<i>Signed disclosure</i> <i>The information, data, advice and opinions provided in this report which I have provided is true and has been prepared in accordance with the Chartered Institute of Ecology and Environmental Management's Code of Professional Conduct. I confirm that the opinions expressed are my true and professional bona fide opinions.</i> <i>Etienne Swarts, ACIEEM</i>	
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SUMMARY

- Greenlight Environmental Consultancy Ltd. has been commissioned to carry out an Ecological Impact Assessment for a development at land adjacent to Sesswick Way, Wrexham, Wales, LL13 0PA (grid reference: SJ 36923 47983).
- This report outlines the habitat features on site, the likelihood of protected species being present and any potential effects of the proposed development on such species.
- The ecology report is required in support of a planning application for the construction of a glasshouse, packing and welfare building, energy centre and heating system, CO₂ storage tanks, customer and DNO substation, access and parking, and a closed irrigation system.
- The survey and assessment were completed by independent, qualified and experienced ecologists with Natural England survey licences for the relevant protected species.
- The findings of the assessment are that the habitats on the site to be affected by proposed works are of **low** ecological value.

Protected habitats/species	Status	Potential effect	Recommended mitigation and enhancements
Protected sites	Two statutory and five non-statutory protected sites within 2km.	No significant impacts on protected sites and their qualifying features.	None required.
Protected habitats and habitats subject to conservation designations	Arable land, a section of hedgerow (Priority Habitat) and scattered trees will be removed as part of the proposed works.	Low scale of habitat loss predicted for wildlife.	<u>Mitigation</u> Soft landscaping scheme to include the planting of new trees and hedgerows around the site, using native species. Construction work to be carried out in accordance with BSI (2012), BS 5837:2012, to protect retained trees and their root protection areas, and BS 42020:2013 to protect waterways (the River Clywedog) from runoff and pollution via the implementation of a Construction Environmental Management Plan ("CEMP").
Bats	High bat roosting potential in building on site. High bat roosting potential in mature trees located on site. No bat roosts present in trees with bat roosting potential to be removed. Moderate value commuting and foraging habitat on	Building not predicted to be directly affected by planned works. No trees with potential bat roosts to be removed or affected. Loss and potential light disturbance of commuting and foraging habitats on site.	<u>Mitigation</u> Soft fell of trees and tree works conducted between September/October and March/April. Lighting schemes should comply with Bat Conservation Trust and CIE 150:2003 guidance, to avoid light spill on hedgerows, trees and 'green buffer' zone. Installation of standalone bat boxes on trees around site.

Protected habitats/species	Status	Potential effect	Recommended mitigation and enhancements
	site. Bat activity surveys recorded low to high levels of foraging and commuting activity, comprising mainly 5 species.		
Breeding birds	Breeding habitat within scrub, hedgerows, trees, building and grassland. 15 priority species confirmed to either breed or possible breed on site. A further seven and nine priority species considered 'quite likely' and 'less likely' respectively to find nesting opportunities on site. No barn owls observed nesting on site during bird survey or aerial inspections of trees.	Loss of arable field, section of species-poor hedgerow and a small number of scattered mature trees. Potential disturbance to breeding birds.	<u>Mitigation</u> Works to any grassland, scrub, hedgerows, trees and buildings on site to be conducted outside bird nesting season or under watching brief of ecologist if during nesting season. Site compound to be located away from bird nesting habitat (e.g. scrub, hedgerows, trees, and the River Clywedog). Soft landscaping scheme to provide bird nesting habitat. Installation of kestrel and small bird boxes on trees.
Great crested newts	No aquatic habitats and some suitable terrestrial habitats on site. 26 ponds within 250m – 16 assessed as below average to excellent suitability for GCN, three dry and seven could not be accessed for detailed assessment. eDNA survey returned a positive result for 12 ponds. Historic records indicate a large GCN population, of National Importance and of European Importance within northeast Wales, near the site.	Loss of some terrestrial habitat including corridors of dispersal (arable land and hedgerow). Temporary disturbance of terrestrial habitat for pipeline works. Risk of injuring or killing individual GCN potentially present within the site. No impacts on aquatic habitats.	<u>Mitigation</u> EPS mitigation licence required prior to any works being conducted. The licence will include the following: Creation of receptor area to the northwest of the site to include terrestrial planting, hibernacula and aquatic habitats. Further mitigation areas to be created along eastern and southern boundaries of site. Exclusion fencing with pitfall traps installed around the site perimeter and checked in suitable weather for at least 60 nights during the GCN active period. Any animals caught to be moved to the receptor site. Phased vegetation clearance and hand search of all suitable refugia. Soft landscaping, using native species, to maintain habitat links across the site. Long-term management of the receptor area and monitoring of GCN population.
Water voles and otters	River Clywedog adjacent the northern	No impacts predicted.	<u>Mitigation</u> None required.

Protected habitats/species	Status	Potential effect	Recommended mitigation and enhancements
	boundary provides suitable habitat for water voles and otters.		
Reptiles	Some suitable habitats on site. Ten reptile records within 2km. No reptiles recorded during presence/absence survey.	Harm to reptiles if present on site during works. Loss of reptile habitat.	<u>Mitigation</u> Proposed GCN mitigation strategy will ensure safe relocation of reptiles. GCN mitigation areas will also benefit reptiles.
Badgers	Habitats suitable for badger setts, foraging and commuting. Site and surrounding landscape used by foraging and commuting badgers. No badger setts identified in proximity to areas of proposed works.	Potential disturbance of badger sett. Permanent loss of foraging habitat.	<u>Mitigation</u> Pre-construction survey for potential newly created badger setts near proposed works areas, to inform appropriate mitigation if required.
Invertebrates	Habitats suitable for a variety of common species.	Loss of arable land, section of hedgerow and some scattered trees.	<u>Mitigation</u> Soft landscaping scheme will benefit invertebrates on site margins.
Other animals	N/A	Potential harm to animals.	<u>Mitigation</u> Porous hedgehog friendly fencing should be used within and around the site. Rough sawn planks placed inside any open excavations. Night lighting of the construction site should be minimised as far as possible. Construction materials should be stored off the ground on pallets.

1. METHODOLOGY

- 1.1. An initial phase 1 walkover of the site was conducted on 20th May 2020 by Sarah Carver – an independent, qualified and experienced ecologist. Survey conditions were as follows: 19°C, 8mph wind, sunny and dry.
- 1.2. All survey methods were carried out in accordance with the most up to date good practice guidance for the relevant protected species. Please refer to Appendix A for the full methodology and species breakdown.
- 1.3. The habitats on and directly adjacent the site were considered unsuitable for the following protected species and no further surveys or mitigation for these species are detailed in this report:
 - White-clawed crayfish *Austropotamobius pallipes*
 - Hazel dormouse *Muscardinus avellanarius*
 - Natterjack toad *Epidalea calamita*

Impact assessment

- 1.4. The results of the desk study and Phase 1 habitat surveys have been used to inform an impact assessment, carried out following the “*Guidelines for Ecological Impact Assessment*” produced by the Chartered Institute of Ecology and Environmental Management (2019).
- 1.5. The magnitude, duration, reversibility, probability of occurrence, and geographic scale of importance of all potential impacts have been evaluated by professional judgments based on the available information.

Protected species survey methods

- 1.6. The protected species survey methods detailed below have been provided as a summary. Please refer to the relevant referenced documents for the full species survey methods, results and conclusions.

Bats

- 1.7. A bat activity survey, aerial inspection and presence/absence surveys were conducted and issued by Gritstone Ecology (2020). The static data has been analysed by Greenlight Environmental Consultancy Ltd. and reported in Appendix P.

Activity surveys

- 1.8. A total of three bat activity surveys were conducted in accordance with the latest bat survey guidelines (Collins, 2016) on the 30th June, 21st July and 21st August 2020 and in suitable weather conditions (Table 1).
- 1.9. Two independent, qualified and experienced surveyors were used per survey: Stewart Bradshaw (Licence number 75887:OTH:CSAB:2017) and Chris Ryan.
- 1.10. Surveys were comprised of two walked transects and three static detectors left in-situ for at least five nights in suitable weather conditions.
- 1.11. Desk study information was used to determine habitat features on site, features likely to be used by bats in flight, and transect routes for the surveys.
- 1.12. Two ecologists walked the transect routes for two hours at a constant speed, recording observations of bats along the route. Where possible the number of bats seen, species, type of activity, and direction of flight, was recorded.
- 1.13. Bat calls were automatically recorded, and the location of the calls GPS tagged to allow more detailed analysis of the calls, and to plot call locations on a map.
- 1.14. The transect start points and directions were varied to ensure that different areas of the transect route were walked, at different times relative to sunset. Motorola two way radios, were used to relay information between surveyors.
- 1.15. Bat calls were recorded using an Elekon Batlogger M, Elekon Batlogger A+ and three SM2 static bat recorders. Call data was analysed using Elekon Bat Explorer and AnalookW software.
- 1.16. Constraints:
 - i. The first survey on 30th June 2020 had to be cut short by approximately 30 minutes because of torrential rain.
 - ii. During the third survey on 21st August 2020 the maize crop was above two metres, making movement around the field boundaries, and visual observation of bats, difficult in some areas. As a result, it was not possible to walk a section of transect B (the eastern side of the site) which passes a remnant hedgerow in an arable field.

Aerial inspection

- 1.17. The survey was completed on the 30th June 2020. Weather conditions during the survey were warm and dry with temperatures of 20°C.
- 1.18. An independent, qualified and experienced surveyor conducted the survey: Stewart Bradshaw (Licence number 75887:OTH:CSAB:2017).

- 1.19. Three trees (T8a, T11a and T11b, Figure 5) were inspected from ground level, using binoculars and a Clulite torch, and then climbed and inspected where suitable features were present.
- 1.20. The equipment listed below was available for use during the surveys and was used where required.
- 1.21. Clulite CB2 1,000,000 candlepower torch. Rigid Seesnake CA-300 digital endoscope with 0.9m cable reach with 17mm and 6mm imaging heads. Digital camera with 50x zoom. 8x25 close focussing binoculars, 4m ladders, bat handling gloves, DNA sampling tubes.
- 1.22. Constraints:
 - i. T8a, on the northern site boundary was not originally highlighted for inspection, and at the time of the climbed inspections of T11a & T11b, had nesting kestrels present, and could not be climbed. As it is not known whether the tree will be directly affected by the proposed works, a ground inspection was completed.

Presence/absence surveys

- 1.23. A total of three bat activity surveys (comprised of a dusk emergence and two dawn return-to-roost surveys) were conducted on trees T8a and T11b (Figure 5), within the optimal surveying season for bats and in suitable weather conditions (Table 2).
- 1.24. Four independent, qualified and experienced surveyors were used per survey: Stewart Bradshaw (Licence number 75887:OTH:CSAB:2017), Chris Ryan and two assistants.
- 1.25. The dusk surveys started approximately 15 minutes before sunset and finished approximately 1.5 hours after sunset. The dawn survey started approximately two hours before sunrise and ended approximately 15 minutes after sunrise.
- 1.26. Ecologists visited the site at dusk and dawn, to listen to, and record bats, and watch for bats emerging from, or returning to roosts, and compile information on species, numbers, access points, and locations. The surveys were informed by a tree inspection, which identified potential roosting and access points. These points were covered by an observer during the surveys. Motorola two-way radios, were used to relay information between surveyors.
- 1.27. The equipment listed below was available for use during the surveys and was used where required.
- 1.28. Clulite CB2 1,000,000 candlepower torch. Rigid Seesnake CA-300 digital endoscope with 0.9m cable reach with 17mm and 6mm imaging heads. Digital camera with 50x zoom. 8x25 close focussing binoculars, 4m ladders, bat handling gloves, DNA sampling tubes.
- 1.29. Bat calls were recorded using an Elekon Batlogger M and Elekon Batlogger A+ bat recorders. Call data was analysed using Elekon Bat Explorer software.

- 1.30. Infra-red night vision video cameras, fitted with wide and telephoto lenses, and infra-red lamps were used to observe the trees. The cameras recorded for the full length of the surveys, the videos were checked during and after the surveys were completed.

Birds

- 1.31. A bird survey was conducted and reported by Marches Ecology (2020).
- 1.32. A reconnaissance survey was conducted on 24th June 2020 by Tom Knight B.Sc (Hons), PgDip Conservation Management, MCIEEM, CEnv. The weather was 100% bright sunshine, 27°C, with a light breeze. The habitat within the application site was assessed for its potential value to nesting birds. Appropriate routes for the subsequent survey visits were also identified.
- 1.33. The breeding bird survey utilised an adapted version of the British Trust for Ornithology's (BTO) Common Bird Census technique (Marchant 1983; Gilbert *et al.* 1998). The Common Bird Census (CBC) utilises territory mapping and is an established and generally accepted methodology. It requires repeated visits to a site during the bird breeding season. Five to ten visits are usually appropriate; open habitats would be at the bottom of this range, while woodland would be at the top (Sutherland 1996). Due to the largely open character of the site five survey visits may be considered sufficient data on distribution, relative abundance and records of species of conservation interest (Hill *et al.* 2005). An additional two evening visits are often completed to consider species such as owls and Woodcock (*Scolopax rusticola*). As bird territories are unlikely to align with the survey site boundary, birds outside this area were recorded where appropriate.
- 1.34. This work was commissioned in late June. A total of two CBC visits were therefore completed by Tom Knight on 30th June and 14th July 2020. As the survey visits commenced late in the survey season, no analysis of possible territories has been undertaken.
- 1.35. An evening visit was undertaken on 21st July 2020. This visit was completed from approximately three hours before dusk to consider species that may be active at this time of the day.
- 1.36. The evening visit used an adapted vantage point (VP) survey protocol rather than walking a CBC route. Vantage point surveys involve collecting information during timed watches from strategic vantage points covering defined areas. Suitable VP locations were identified during the reconnaissance survey. Approximately one to one-and-a-half hours was spent at each location. The following information was recorded:
- Time of registration.
 - Species.
 - Number of birds.
 - Age, phase and sex (if known).

- Activity
- Flight direction.
- Notes on behaviour.

1.37. A different survey protocol was used during the evening visit in the hope that observations would obtain a greater level of detail on particular species, at key locations within the survey site and of key species. Shawyer (2011) states that ‘vantage point surveys ... can be used with some success for barn owls’ where certain site conditions are met, and further that ‘For development schemes which are small in size (below 75ha), observational surveys can also be useful when attempting to establish those places which are being used for movement and feeding by the resident barn owls’. However, there is some disagreement over the efficacy of this type of survey for recording barn owls (*Tyto alba*). The optimum period for such observational surveys (at potential nest sites) is usually between mid-June and during July (Shawyer *op cit.*). Gilbert *et al.* 1998 also suggests observations immediately before/after dusk. The results of the evening VP survey have not been included on the species maps as they did not achieve full site coverage as the CBC visits did.

GCN

eDNA analysis

- 1.38. In order to determine the presence/likely absence of GCN on site, an eDNA survey was conducted on 16 ponds (ponds 2-9, 17-20, 22-23, 25-26) across three separate dates in May 2020, following the field sampling protocol provided by the Department for Environment, Food and Rural Affairs (“DEFRA”) and Biggs *et al.* (2014).
- 1.39. The surveys were undertaken by Sarah Carver (Natural England GCN survey licence level 1 2015-16713-CLS-CLS, Natural Resources Wales GCN survey licence level 1 S085140/1).
- 1.40. The eDNA method detects pond occupancy from GCN using traces of DNA shed into the pond environment. The water samples collected were sent to SureScreen Scientifics for laboratory analysis.
- 1.41. The results of the analysis are defined as follows by SureScreen Scientifics:
- **Sample Integrity Check (“SIC”):** Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the Sample is of adequate integrity when received. Pass or Fail.
 - **Degradation Check (“DC”):** Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

- **Inhibition Check (“IC”):** PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.
- **Result:**
 - **Negative:** Means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence.
 - **Positive:** Means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed.
- **Positive Replicates:** To generate the results all of the tubes from each pond are combined to produce one eDNA extract. Then twelve separate analyses are undertaken. If one or more of these analyses are positive the pond is declared positive for the presence of GCN. It may be assumed that small fractions of positive analyses suggest low level presence but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive.

Historic records

- 1.42. Historic records, obtained from Cofnod North Wales Environmental Information Service, were interrogated to review whether the ponds had previously supported GCN. Records are presented in Table 5.

Constraints

- 1.43. Limitations and constraints affecting survey techniques are detailed in the document titled ‘GCN Survey Report – Wrexham 200713’ (Greenlight, 2020) where the percentage of the shorelines/pond margins that could be accessed is specified. Access to the steep sides of some ponds, silted ponds and those in dense impenetrable woodland was challenging.

Reptiles

Presence/absence survey

- 1.44. An initial site walkover was completed to determine areas within the site which have potential for reptiles. A total of 75 artificial refugia consisting of flat bitumen felt, corrugated felt, carpets and corrugated tin (approximately 0.5m²) were placed within what was considered to be the most suitable reptile habitat, based on surveyor experience and knowledge, and left in-situ for one-two weeks prior to monitoring commencing. In order to determine whether the site

supported reptiles, habitats selected for survey consisted predominantly of south facing slopes of the grasslands and suitable field margins. Froglife (1999) Reptile survey (Advice Sheet 10) guidelines recommend for general survey purposes placing 5-10 refuges per hectare. The use of 75 refugia to determine reptile presence constitutes a robust and appropriate survey approach and demonstrates substantial survey effort and greater than that recommended in order to establish the status of the site in terms of supporting reptiles.

- 1.45. In accordance with Froglife (1999) Reptile survey (Advice Sheet 10), in order to establish presence, seven checks to each of the 75 refugia were completed between 20th July and 26th August 2020. At each visit, each felt, carpet or tin was checked above and underneath to determine presence of reptiles. This survey effort is in accordance with the seven visits specified in the guidelines required to determine presence. The Froglife guidelines recommend that the timing of surveys should be during periods of reptile activity between 08.30-11:00 and 16:00–18:30 during suitable weather conditions avoiding wind and rain and specify the months of April, May and September as being suitable with temperatures between 9°C and 18°C. Details of the weather, conditions and timing of surveys are presented in Table 6.
- 1.46. Surveys were led by Sarah Carver, an ecologist with a period of 28 years experience of field survey.
- 1.47. Limitations:
 - i. Whilst every effort was made to undertake surveys during the most suitable of conditions available, surveys were required to be undertaken during July and August at the most favourable time of the day often dictated by weather conditions due to project timescale constraints and therefore inevitably conditions and timing during some of the visits were sub-optimal.

2. SITE CONTEXT

Location

- 2.1. The general location of the site is shown in Figure 1 below.
- 2.2. The site is situated southwest of Wrexham industrial estate and northeast of the small village of Marchwiel. The A525 runs west approximately 0.2km south of the site, Sesswick Way borders the site to the east and Cefn Road lies approximately 0.1km north. To the west a large sewage works and solar panel farm are situated. The town of Wrexham is approximately 1.3km northwest.
- 2.3. The site is enclosed by small agricultural fields north and south, the sewage plant and solar farm to the west and Sesswick Road to the east.
- 2.4. The wider landscape is comprised of arable fields lined with hedgerows and trees as well as residential dwellings and industrial units. The River Clywedog is approximately 0.1km north of the site and the River Dee is approximately 2km southeast of the site.



Figure 1

Satellite image of site surroundings, site indicated by red line.

Image © Google, date accessed 15/05/2020

3. DESCRIPTION OF THE DEVELOPMENT

- 3.1. The proposed project involves the installation of the components detailed below. Please refer to Appendix J for the proposed plans.

Glasshouse buildings

- 3.2. The development will consist of two 8ha glasshouses, comprised of structural steelwork and high specification glass designed for maximum light transmission and covering a total of 16ha of land, each having a maximum gutter height of 7m and gable apex height of 8m, inclusive of the 30cm high concrete perimeter foundations. Internally, the buildings will contain a steel support post mounted on pre-cast concrete pile and a 5m wide reinforced concrete path running centrally along the length of the glasshouse. Other features of the glasshouse buildings include matte aluminium growing gutters, installed at approximately 4m intervals across the width of the buildings and a 5m wide stone access road around the outside perimeter of the glasshouse for construction purposes, to be retained during operations for maintenance.

Packing and welfare building

- 3.3. The packing and welfare building, located to the north of the glasshouse building, will cover an area of approximately 0.6ha and comprise elements including the packing area, canteen/toilets, irrigation, storage rooms and site offices. The building will be 8m high and clad externally with a mix of profiled and flat panel coated steel cladding, with an architectural grey finish to blend into the existing skyline when viewed from distance. The floor will be concrete slab and the packing area will include three loading docks with external ramps to loading bays.

Energy centre / heating system

- 3.4. Ground source heat pumps will be located in the energy centre, connected to the nearby sewage treatment works through underground closed-loop high-density polyethylene (HDPE) pipes. In addition to the heat pumps, gas combined heat and power (CHP) units will be installed to provide supplementary high temperature water for heating, carbon dioxide and electricity, with air inlet and outlets located on the roof to provide air flow for the CHP. Conventional gas boilers will be installed purely for redundancy purposes.
- 3.5. For maintenance and safety purposes, five electrical transformers surrounded by palisade fencing and six dry air coolers will be located outside the energy centre building.
- 3.6. Two insulated vertical heat store tanks will be located adjacent to the energy centre building, mounted on reinforced concrete base. These tanks will have an above ground side height of 10m, a 12.5m apex height and a 25m diameter.

- 3.7. Five water silos will also be installed adjacent to the energy centre and be mounted on concrete tiles. The silos will have an 11m diameter and be 6 m high with a flat roof.

CO₂ storage tanks

- 3.8. Currently the adjacent water treatment works is venting CO₂ into the atmosphere as a waste product. This CO₂ will be captured and transferred via an HDPE pipe buried underground to the glasshouse.
- 3.9. Three stainless steel vacuum CO₂ tanks, 14m length and 2.5m diameter, will be installed externally near the energy centre building, with buried mains pipes supplying CO₂ to growing gutters within the glasshouses.

Customer substation

- 3.10. An on-site substation for the supply of electricity to the project, approximately 3m in height, 10m in length and 3m in width, will be installed externally near the energy centre building.

DNO substation

- 3.11. The Distribution Network Operator (DNO) will install an on-site substation for the supply of electricity to the project. The substation design will be dependent on the specific requirements of the DNO, but will typically be dark green GRP construction, approximately 3.5m in height, 7.5m in length and 3m in width.
- 3.12. It should be noted that final equipment suppliers and contractors for the project have yet to be selected. Whilst some variation in the equipment may be necessary we do not envisage significant variation in the presented elevations and footprints.

Access and parking

- 3.13. All areas on site to be used by HGVs will be concrete, including the access road, turning area and three HGV loading bays adjacent to the packhouse, which will be sunk 1.4m below ground level. A staff and visitor parking area will be surfaced with compacted stone hardstanding.
- 3.14. Access to the site will be required for project vehicles during the proposed daily operational hours of 06:00 to 18:00 on weekdays and occasional weekend work 06:00 to 15:00. Approximately 150 members of staff will be employed at the facility, of which around 125 will be employed in the glasshouse and 25 in the packhouse and offices; all staff will travel to and from work daily from the local area and no on-site living accommodation will be required in relation to the development.

Closed irrigation system

- 3.15. Irrigation of crops in the glasshouse will comprise a closed system, requiring external supply of mains water only as emergency back-up when the normal working system is off-line. The system comprises two main elements, described as follows:
- 3.16. Rainwater Reservoir: Fall pipes will be attached to the gutters at each gable end (north and south), channelling rainwater from the glasshouse roof to buried drainage pipes. This water will supply lined storage reservoirs adjacent to the glasshouse and is then pumped back to the irrigation room upon demand. The reservoirs will be sized to meet not only the glasshouse irrigation requirements but also have adequate spare attenuation capacity at all times to meet a 1 in 100 storm event. Depending on the local water table, the reservoirs may be raised up to approximately 1m in height.
- 3.17. Recycled irrigation water: Internal condensation will be captured via internal gutters on the roof and side walls. In addition, water not absorbed by the plant will be collected at either end of the growing gutters will be collected and pumped to “brown” water silos, before being fed to the irrigation room for filtration and UV treatment. The treated water will be blended with reservoir water and stored in clean water silos. Upon irrigation demand the plant nutrients are added in the irrigation room before being gifted back to the plants via the growing gutters; the process is repeated in a loop. A maximum of five water storage silos with approximately 6m height and 11m diameter will be installed adjacent to the energy centre buildings.
- 3.18. A small amount of external mains water supply is used for the washing of produce prior to packing.

Utilities trench

- 3.19. The utilities trench will run underground for approximately 465m from the glasshouse development to the Five Fords WwTW, the underground closed-loop high-density polyethylene (HDPE) pipes will connect the ground source heat pumps located in the energy centre to the proposed heat exchanger building (see below).
- 3.20. The utilities trench will incorporate the following elements:
- ii. Trench 2m depth, 4.2m width, includes:
 - Two 630mm HDPE pipes with 500mm between them to prevent thermal transfer
 - One 33kV 300mm private electricity cable from energy centre to heat exchanger building transformer
 - One 150mm ducted private fibre communications cable
 - iii. Coming off the utilities trench to the north includes:

- One 33kV 300mm ducted mains electricity connection from the electricity network to site boundary.
- One 300mm steel gas pipe from intermediate gas pipeline to site.

Heat exchanger building

- 3.21. The proposed heat exchanger building will be located within the Five Fords WwTW site and is unrelated to the undertaking of Welsh Water.
- 3.22. The mono pitch steel framed building will be 19.4m in length, 14.4m in width, with eaves height 6m on the low side and 8m on the high side, with a mono pitch of 7.5°. The eaves will have galvanised steel box gutters with PVC downpipes. A roller shutter door will be located on the long side, with an adjacent steel personnel door.
- 3.23. Adjacent to the heat exchanger building will be a small outdoor electrical transformer and an underground cesspit to collect any water used in cleaning the heat exchangers.

CO₂ Recovery plant

- 3.24. Situated to the southeast of the Five Fords WwTW facility will be:
- A CO₂ recovery plant measuring 6m x 12m and 6.35m in height.
 - Two air coolers situated at ground level either side of the recovery plant measuring 8.8m in length, 1.47m in width and 1.32m in height.
 - A small gas booster of 1.4 x 2 x 1.6m in height.

4. DESKTOP REVIEW

Protected sites

Statutory

- 4.1. There are two statutory protected sites located within 2km – one Sites of Special Scientific Interest (“SSSI”) and one Special Conservation Area (“SAC”). Please refer to Appendix B for the full citation.

- i. River Dee SSSI, approximately 2km southeast.

*“The River Dee is notified for its nationally important transition through a range of river types from mesotrophic to eutrophic. It is also notified for Atlantic salmon *Salmo salar*, otter *Lutra lutra*, club-tailed dragonfly *Gomphus vulgatissimus* and fluvial geomorphology.”*

- ii. River Dee & Bala Lake SAC, approximately 2km southeast.

“The River dee has its source in Snowdonia at the outflow of Llyn Tegid and it includes the Ceiriog Meloch, Tryweryn and Mynach tributaries. Its catchment contains a wide spectrum of landscape from high mountains around Bala, rugged peaks near Llangollen, steep sided wooded valleys, and the plains of Cheshire, Flintshire, north Shropshire and Wrexham.”

- 4.2. The proposed development falls outside of all SSSI Impact Risk Zones.

Non-statutory

- 4.3. There are five non-statutory protected sites located within 2km – five Wildlife Sites (“WS”).

- i. Marchwiell Marsh WS, approximately 0.5km west.

“Marshy field between school and disused railway line. Past improvement has lead to it being dominated by rushes; hard rush, soft rush and jointed rush are all abundant. Grasses are also prevalent with timothy and yorkshire fog the most common. Herbs are represented in the main by creeping buttercup and great willowherb, but other species present include black knapweed, hairy sedge, bog stitchwort and meadowsweet.”

- ii. Cefn Park WS, approximately 1.5km north.

*“This site is a series of broadleaved woodland within Cefn Park Estate. Big Wood is the largest (8.9ha) and is dominated by ash with oakm sycamore and occasional mature wych elm. The understorey is continuous with frequent holly, young sycamore and sych elm. Part of the wood has been underplanted with conifers but which are not thriving. There is a rich ground flora which includes dog’s mercury, bluebell, wood anemone and ramsoms *Rhododendron Spinney* is also dominated by ash but with beech and sweet chestnut and locally dense understorey of*

rhododendron. Alder, creak and goat willows dominate the poorly drained eastern side where great horsetail and greater pond sedge occur as well as a fen dominated by common reed."

- iii. Peter's Dingle WS, approximately 1.5km east.

"An ash/oak woodland along a brook. The understorey is of wych elm, elder, hawthorn and haze,, the latter becoming abundant in areas where it has been coppiced. Also present is some wild provet. The field layer is often dominated by ivy, bramble and nettles. Other species found were dog's mercury, yellow archangel, giant fescue, black bryony and hartstongue fern."

- iv. Wrexham Industrial Estate WS, approximately 1.8km northeast.

"A series of sites within the industrial estate which includes unmanaged grassland at Bryn Road and on Cefn park land and ancient broadleaved woodland Erlas Black Wood. The derelict land known as Cefn Park, on the southern edge of the Industrial Estate, consists of a complex of mosaic of scrub, grassland and tall herb. Species-rich grassland occurs where there is rabbit grazing with cowslip, restharrow, yellowwort, common centuary and birdsfoot trefoil. Other species of interest include dyers greenweed in among scrub and grass vetchling in rank grassland. Worn paths and motorbike tracks criss-cross the site and many species present such as prickly lettuce, smith's pepperwort and bristly ox-tongue typify disturbed ground. A mosaic of woodland and damp grassland occurs adjacent to the River Clywedog. The woodland is dominated by mature hawthorn with alder and crack willow along the river. The ground flora is sparse but dog's mercury, hart's tongue and male fern do occur. Meadowsweet, great willowherb, and canary reed grass occur in the damper patches. The strip of species-rich grassland beside a ditch on Bryn Road has similar grassland species including the uncommon grass vetchling. False fox sedge, yellow flag and bullrush are a few of the species which occur in the ditch. Erlas Black Wood is dominated by mature oak."

- v. Hopyard Wood WS, approximately 1.9km south.

"Two woods which have been planted up with hybrid poplars and conifers. Other canopy trees are sycamore and ash. The understorey has elder, hawthorn and snowberry. The field layer is poor, mostly nettle, ivy, bramble and dog's mercury. Other species present though include bluebell, opposite-leaved golden saxifrage, yellow archangel and bugle."

Protected habitats and habitats subject to conservation designations

- 4.4. Priority Habitats, as listed under the NERC Act 2006 Section 41 Habitats of Principal Importance found on site include: Hedgerows, with Deciduous Woodland and Rivers adjacent the site.
- 4.5. No other Priority Habitats to occur within 2km (identified using MAGIC – managed by Natural England).

Protected species

4.6. The biodiversity data search within 2km of the site indicated 2373 records from 149 species.

4.7. Records of note within 2km and relevant to the proposed development works are:

- Forty-five barn owl *Tyto alba* records, with the most recent from 2017.
- Eight skylark *Alauda arvensis* records, with the most recent from 2012.
- Ten swift *Apus apus* records, with the most recent from 2016.
- 726 GCN *Triturus cristatus* records, with the most recent from 2020. The closest record is located immediately south of the site.
- Ten reptile records, with the most recent from 2018. The closest record is located just beyond the south-east corner of the site. Species include: slow-worm *Anguis fragilis*, grass snake *Natrix helvetica* and adder *Vipera berus*.
- Twenty-six badger *Meles meles* records, with the most recent from 2017. The closest record is located approximately 350m west of the site.
- Thirty-four otter *Lutra lutra* records, with the most recent from 2019. The closest record is located approximately 180m north-east.
- Two water vole *Arvicola amphibius* records, with the most recent from 2000. The closest record is located approximately 0.8km south.
- Twenty-six hedgehog *Erinaceus europaeus* records, with the most recent from 2019.
- Sixty bat records, with the most recent from 2017, including common pipistrelles *Pipistrellus pipistrellus*, soprano pipistrelles *Pipistrellus pygmaeus*, brown long-eared *Plecotus auritus*, noctules *Nyctalus noctula*, Daubenton's *Myotis daubentonii*, *Myotis* species *Myotis sp.*, Brandt's *Myotis brandti*, Whiskered *Myotis mystacinus* and other unidentified bat species.

Protected species licences

4.8. A 2km search on <http://www.magic.gov.uk/> indicated no records of granted European Protected Species ("EPS") Mitigation Licences.

5. FIELD STUDY

Habitats

- 5.1. The habitats on the site are of **low** ecological value, being mainly arable land with peripheral hedgerows and mature trees. Outside of the boundary, habitats comprised mature broadleaved woodland, numerous ponds, scrub and grasslands. Hedgerows, some of which were interspersed with mature trees, were present on the boundaries.
- 5.2. Appendix K provides a phase 1 map of the habitats present on the site and target notes from the different habitats or areas of note are provided in Appendix L. NERC Act 2006 Section 41 habitats have been identified where relevant. A full list of plant species recorded on site is attached in Appendix D. Appendix M contains a selection of photographs of site habitats.

Semi-natural broadleaved woodland (phase 1 habitat classification A1)

- 5.3. Established broadleaved mature woodland is present on the outside of the proposed site boundary in the southeast corner. A linear woodland was aligned along the southern boundary of the site along a disused railway. Primarily mature oak *Quercus robur* was the dominant species and along the former railway track, the ancient woodland indicator dog's mercury *Mercurialis perennis* was present. An inspection from the position of the arable field, noted species including ash *Fraxinus excelsior*, elder *Sambucus nigra*, hawthorn *Crataegus monogyna*, willow *Salix sp.* and holly *Ilex aquifolium*.
- 5.4. Individual mature trees were present at TN11 (oak) and a mature sycamore *Acer pseudoplatanus* at TN12.

Scrub (phase 1 habitat classification A2)

- 5.5. Bramble *Rubus fruticosus*, hawthorn, grey willow *Salix cinerea*, goat willow *Salix caprea* (possibly hybrids) and dog rose *Rosa canina* were present within these areas, especially around the ponds.

Neutral grassland (phase 1 habitat classification B2)

- 5.6. Small areas of grassland with a ruderal mosaic were noted though not studied in detail. Areas include the eastern side of the track dividing the two main arable compartments, an area to the west of the proposed site within Welsh Water land to the north and surrounding the large lagoons, and an area to the north surrounding a brick building.

- 5.7. Frequent grass species included Yorkshire fog *Holcus lanatus*, false oat grass *Arrhenatherum elatius*, cock's-foot *Dactylis glomerata*, common bent *Agrostis capillaris*, creeping bent *Agrostis stolonifera*, red fescue *Festuca rubra*, annual meadow grass *Poa annua*, brome *Bromus sp.* and perennial rye grass *Lolium perenne*.
- 5.8. Other species consisted of colt's-foot *Tussilago farfara*, occasional common vetch *Vicia sativa*, creeping thistle *Cirsium arvense*, ribwort plantain *Plantago lanceolata* and garlic mustard *Alliaria petiolate*.

Tall ruderal (phase 1 habitat classification C3.1)

- 5.9. Tall ruderal species included dominant common nettle *Urtica dioica*, occasional rosebay willow herb *Chamaenerion angustifolium*, teasel *Dipsacus fullonum* and broad-leaved dock *Rumex obtusifolius*. Hogweed *Heracleum sphondylium*, spear thistle *Cirsium vulgare* and mugwort *Artemisia vulgaris* were also frequent.

Running water (phase 1 habitat classification G2)

- 5.10. The River Clywedog was present to the north of the site TN6. The river had a shingle/stone base at the point it was studied. Species recorded were Himalayan balsam *Impatiens glandulifera* and alexanders *Smyrniololus olusatrum*. Crack willow *Salix fragilis*, sycamore and grey willow were also present.

Arable (phase 1 habitat classification J1.1)

- 5.11. A recently sown crop was germinating within the main eastern compartment. A longer established crop was present in the western compartment.

Intact hedge (phase 1 habitat classification J2.1)

- 5.12. The species rich hedgerows including that at TN10 comprise hawthorn, blackthorn *Prunus spinosa*, field maple *Acer campestre* and elder. The hedgerows were interspersed with mature trees. Several oaks were recorded.
- 5.13. A young planted hedgerow (estimated 10 years old) on the eastern boundary TN9 consisted of field maple hawthorn, blackthorn, hazel *Corylus avellana* and rose *Rosa sp.*
- 5.14. The intact species poor hedge along the track dividing the two arable compartments comprised predominantly hawthorn.

- 5.15. The remnant hedge in the eastern arable compartment was on a raised ridge higher than the surrounding ground and comprised of hawthorn and elder.
- 5.16. These hedgerows are classified as Priority Habitats under the NERC Act 2006 Section 41 Habitats of Principal Importance, but do not qualify as “important” under The Hedgerow Regulations 1997, lacking the required number of native woody species.

Dry ditch (phase 1 habitat classification J2.6)

- 5.17. To the west of ponds 17, 18 and 19 was a dry ditch approximately 0.5m wide and 1m deep. It was connected to ponds 18 and 19.

Buildings (phase 1 habitat classification J3.6)

- 5.18. A brick building was present at TN7 within the northern part of the site. It was surrounded by grassland and scrub with trees. Area was fenced and access not gained for detailed assessment.

Track (phase 1 habitat classification J5)

- 5.19. A track and public right of way was aligned north to south dividing the arable land into two distinct compartments. A hedge bordered the western side and a strip of grassland was situated to the east of the track.

Bats – physical inspection

- 5.20. There are one building and several mature trees with bat roosting potential located on site, as indicated in Appendix K.

Building one

- 5.21. Authorised access to the brick building was unavailable during the site visit, being surrounded by a locked fence. The single-storey brick building has a slate tiled roof and appears to have been used for bat mitigation, with several slots and holes created in the eastern and northern elevations. The doors have been boarded-up.
- 5.22. The building is assessed as **high** roost suitability for bats due to its location and potential roosting features observed from a distance.

Trees

- 5.23. The trees around the site boundary were assessed for bat roosting potential.
- 5.24. The mature trees on or adjacent the site (Appendix K) were assessed as having **high** roost suitability for bats based on their location, age and suitable features (dead wood, broken limbs, crevices, dense growth and significant ivy coverage).
- 5.25. The remaining trees are assessed as **negligible** bat roosting potential, due to their age and/or lack of features.

Foraging and commuting links

- 5.26. The landscape immediately adjacent to the site is considered of **high** value for foraging and commuting bats, with hedgerows, treelines, broad-leaved woodland and the River Clywedog providing links to the wider landscape.
- 5.27. The site itself provides **moderate** value foraging habitat for bats around the scattered trees, and along hedgerows and woodland edges.

Bats – protected species surveys

Activity surveys (static survey)

- 5.28. Please refer to the text below for a summary of the findings and Appendix P for the full survey findings.
- 5.29. The static detector surveys recorded **low** to **high** levels of foraging and commuting activity across the site. Although the majority of the activity was attributed to soprano pipistrelles,

several other species were recorded including common pipistrelle, brown long-eared, noctules, and *Myotis sp.*

- 5.30. The majority of bat activity was recorded on detectors one and two, situated along the western boundary and along the hedgerow in the centre of the site respectively. This activity indicates the hedgerows in these areas are used for a mixture of foraging and commuting, with the latter of higher importance being used on a more regular basis. Although detector three recorded minimal activity, bats were observed to be commuting and foraging along the disused railway to the south of the site, rather than along the eastern boundary during the transect surveys.

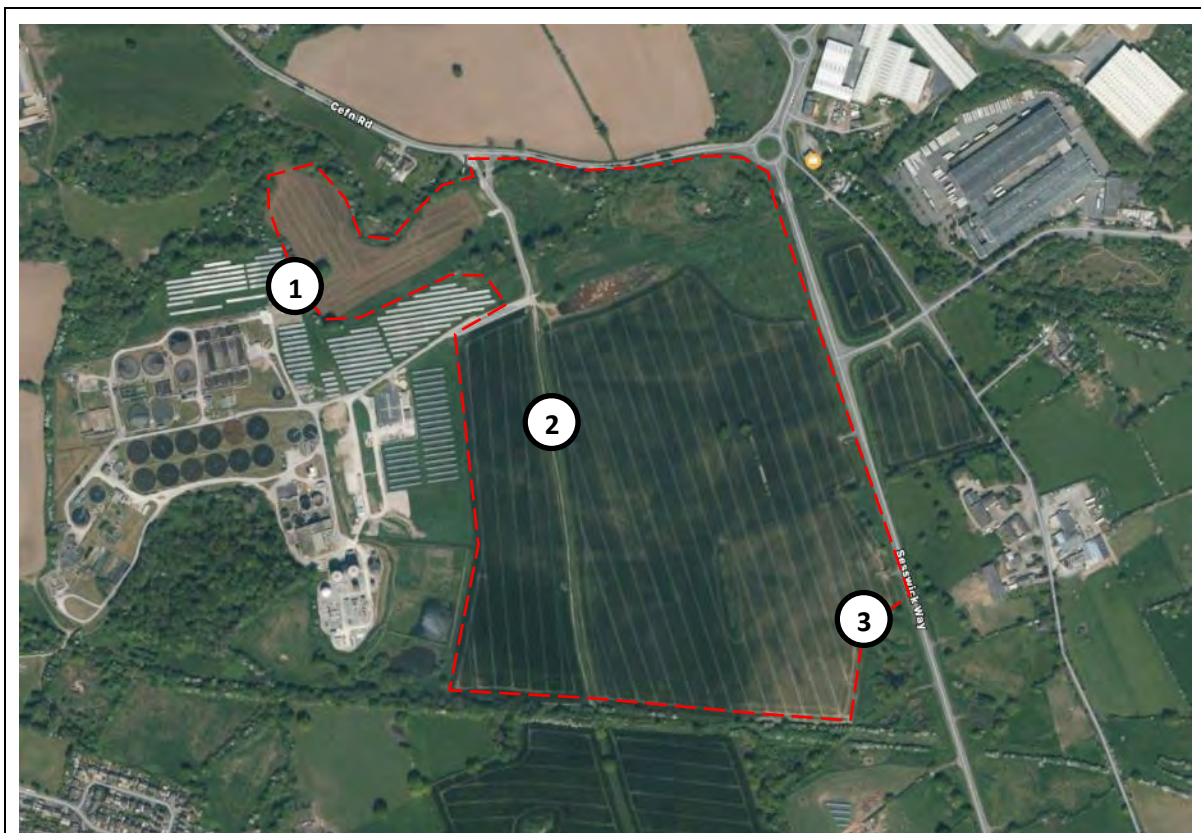


Figure 2

The site boundary and location of the static detectors are indicated by the dashed red line and numbers respectively.

Image © Google, date accessed 27/08/20

Activity surveys (transect survey)

- 5.31. Please refer to the text below for a summary of the findings and Appendix Q 'Bat Activity Survey Report – Wrexham 200826' (Gritstone Ecology, 2020b) for the full survey findings.
- 5.32. The survey conditions, start/end times and sunset/sunrise times are indicated in Table 1 below:

Visit	Date	Conditons		Start of survey	End of survey	Sunset/sunrise
1	30/06/20	Temp Cloud cover Wind Precipitation	15°C 50% Still Rain last 30 minutes	21:40	23:40	21:41
2	21/07/20	Temp Cloud cover Wind Precipitation	13°C 10% Still None	21:20	23:25	21:22
3	17/08/20	Temp Cloud cover Wind Precipitation	18°C 100% Still None	20:25	22:25	20:25

Table 1, bat activity surveys information.

- 5.33. The two walked transects are shown in Figure 3 and comprised of Transect A (western half of the site) and Transect B (eastern half of the site).
- 5.34. Species recorded during the surveys include common pipistrelle, soprano pipistrelle, noctule, *Myotis sp.* (including Daubenton's) and brown long-eared.
- 5.35. The majority of foraging and commuting activity was recorded along the River Clywedog in the north, along the treeline to the south, on the western boundary adjacent the water treatment works, and adjacent ponds in the southwest corner.
- 5.36. Lower levels of activity were recorded along the central track which runs north-south between the two arable fields, and activity adjacent Sesswick Way was limited to a low number of commuting passes.
- 5.37. The most commonly recorded bats on site were soprano pipistrelles. The maximum number of soprano pipistrelles recorded in flight together was two. Common pipistrelles were recorded less frequently. Pipistrelle species bats are commonly associated with urbanised habitats, and are typically more tolerant of light and disturbance than other species.
- 5.38. Noctule bats were the second most commonly recorded species on site, and were seen foraging and commuting along the site boundaries. The species typically roost in, and forage above, trees and woodlands.

- 5.39. *Myotis* sp. including Daubenton's bats were the third most recorded species on site. Daubenton's bats were seen foraging above water on the River Clywedog to the north, and close to ponds adjacent the southwest corner of the site. Other *Myotis* species such as whiskered / Brandt's, and natterers are likely present.
- 5.40. Only one brown long eared bat call was recorded during the transects. This was in an area of clutter adjacent the River Clywedog. Brown long eared bats typically favour darker habitats to forage and commute.
- 5.41. No horseshoe bats were recorded during the surveys.



Figure 3

Transect routes. Transect A: orange, Transect B: blue. Gritstone Ecology (2020).



Figure 4

Aerial photograph with locations and species of all bats recorded during the bat activity transects Gritstone Ecology (2020).

Key: common pipistrelle: red, soprano pipistrelle: peach, noctule: blue, brown long-eared: pink and *Myotis* sp: green.

Aerial inspection

- 5.42. Please refer to the text below for a summary of the findings and Appendix R 'Aerial Inspection Report – Wrexham 200826' (Gritstone Ecology, 2020a) for the full survey findings.
- 5.43. T8a is a mature oak tree on the northern site boundary adjacent a public right of way. Climbed inspections of the tree could not be completed as nesting kestrel were present at the time of the survey. The tree has a number of features which could be used by roosting bats including knot holes & pruning injuries with cavities leading into the main stem, and hazard beam cracks in major limbs in the crown. From the ground inspection **T8a has high suitability** for use by roosting bats.

- 5.44. T11a has a number of superficial features such as dead branches and knot holes which do not provide suitable roosting habitat for bats. **T11a has negligible suitability** for use by roosting bats.
- 5.45. T11b has a 2m long x 2cm wide split in the bark of a near vertical limb in the west side of the crown, which allows access into a 2cm cavity between bark and heartwood. Although shallow, the cavity is extensive and travels for more than 1m upward and downward. No evidence of use by bats was present at the time of inspection. However, the cavity cannot be fully, and confidently, inspected by endoscope. **T11b has high suitability** for use by roosting bats.
- 5.46. Please refer to the presence/absence surveys detailed below (section 5.49) for further survey effort on T8a and T11b.
- 5.47. Although a kestrel nest was present within T8a, no evidence of barn owls was present in any of the trees climbed.



Figure 5

Tree locations, numbers and level of suitability. Red circle: high suitability, blue circle: negligible suitability. Gritstone Ecology (2020).

Presence/absence surveys

5.48. Please refer to the text below for a summary of the findings and Appendix S 'Bat Presence - Absence Survey Report – Wrexham 200826' (Gritstone Ecology, 2020c) for the full survey findings.

5.49. The survey conditions, start/end times and sunset/sunrise times are indicated in Table 2 below:

Visit	Date	Conditons		Start of survey	End of survey	Sunset/sunrise
1	17/07/20	Temp Cloud cover Wind Precipitation	15°C 50% Still None	03:05	05:22	05:07
2	31/07/20	Temp Cloud cover Wind Precipitation	17°C 100% Still None	03:25	05:45	05:28
3	17/08/20	Temp Cloud cover Wind Precipitation	16°C 100% Still None	20:15	22:15	20:33

Table 2, bat activity surveys information.

5.50. The dusk and dawn surveys of T8a and T11b recorded no bats roosting, and only low levels of bat activity were recorded throughout the surveys.

Birds

5.51. Please refer to the text below for a summary of the findings and Appendix T 'Bird Survey Report – Wrexham 200805' (Marches Ecology, 2020) for the full survey findings.

5.52. The survey conditions and start/end times are indicated in Table 3 below.

Visit number	Date of survey	Conditions (at start)	Start of survey	End of survey
1	30/06/20	Air temperature: 13.6°C Cloud cover: 100% Wind: 0-1 BF Rain: none	05:50	10:20
2	14/07/20	Air temperature: 13.8°C Cloud cover: 100% Wind: 1-2 BF Rain: brief spell of light drizzle	05:50	11:05
3	21/07/20	Air temperature: 19.1°C Cloud cover: 95% Wind: 0-1 BF Rain: none	18:00	23:30

Table 3, bird survey information.

- 5.53. During the reconnaissance survey, three kestrels including at least one juvenile were noted around a mature Pedunculate Oak along the western arable field margin, with a large hollow branch towards the southwest side. Faecal splashing, some feathers/down and flies were noted around this hole. This tree had been used for nesting by a pair of Kestrel. The ground beneath this tree had been greatly disturbed by agricultural operations.
- 5.54. The results of the breeding bird survey are summarised in Table 4 below which lists all of the birds recorded from within/over the survey site. As territorial analysis has not been undertaken it has not been possible to provide an estimate of breeding pairs. The conservation status, where applicable, is provided in the second column.
- 5.55. The terms used in the site status column follow those used by the BTO (Non-breeding, Possible breeder, Probable breeder and Confirmed breeder).

Common name	Latin name	Conservation status	Site status
Mandarin	<i>Aix galericulata</i>		Possible breeder
Mallard	<i>Anas platyrhynchos</i>		Possible breeder
Pheasant	<i>Phasianus colchicus</i>		Possible breeder
Sparrowhawk	<i>Accipiter nisus</i>		Possible breeder
Buzzard	<i>Buteo buteo</i>		Possible breeder
Kestrel	<i>Falco tinnunculus</i>	S7, UK Amber, Wales Red	Confirmed breeder
Hobby	<i>Falco subbuteo</i>	Sch1	Possible breeder
Lapwing	<i>Vanellus vanellus</i>	S7, UK Red, Wales Red	Possible breeder
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	S7, UK Amber, Wales Red	Non-breeding. Flying over.
Lesser Black-backed Gull	<i>Larus fuscus</i>	UK Amber, Wales Amber	Non-breeding. Flying over.
Herring Gull	<i>Larus argentatus</i>	S7, UK Red, Wales Red	Non-breeding. Flying over.
Stock Dove	<i>Columba oenas</i>	UK Amber	Possible breeder
Woodpigeon	<i>Columba palumbus</i>		Possible breeder
Collared Dove	<i>Streptopelia decaocto</i>		Possible breeder
Swift	<i>Apus apus</i>	UK Amber, Wales Amber	Non-breeding. Flying over.
Great Spotted Woodpecker	<i>Dendrocopos major</i>		Possible breeder
Green Woodpecker	<i>Picus viridis</i>	Wales Amber	Possible breeder
Magpie	<i>Pica pica</i>		Possible breeder
Jay	<i>Garrulus glandarius</i>		Possible breeder
Jackdaw	<i>Corvus monedula</i>		Possible breeder
Rook	<i>Corvus frugilegus</i>		Possible breeder
Carrion Crow	<i>Corvus corone</i>		Possible breeder
Blue Tit	<i>Cyanistes caeruleus</i>		Probable breeder
Great Tit	<i>Parus major</i>		Probable breeder

Common name	Latin name	Conservation status	Site status
Skylark	<i>Alauda arvensis</i>	S7, UK Red, Wales Amber	Possible breeder
Sand Martin	<i>Riparia riparia</i>		Non-breeding. Flying over.
Swallow	<i>Hirundo rustica</i>		Non-breeding. Flying over.
House Martin	<i>Delichon urbicum</i>	UK Amber	Non-breeding. Flying over.
Long-tailed Tit	<i>Aegithalos caudatus</i>	Wales Amber	Possible breeder
Chiffchaff	<i>Phylloscopus collybita</i>		Confirmed breeder
Blackcap	<i>Sylvia atricapilla</i>		Probable breeder
Garden Warbler	<i>Sylvia borin</i>		Possible breeder
Lesser Whitethroat	<i>Sylvia curruca</i>		Possible breeder
Whitethroat	<i>Sylvia communis</i>	Wales Red	Confirmed breeder
Sedge Warbler	<i>Acrocephalus schoenobaenus</i>		Probable breeder
Wren	<i>Troglodytes troglodytes</i>		Confirmed breeder
Blackbird	<i>Turdus merula</i>		Confirmed breeder
Song Thrush	<i>Turdus philomelos</i>	S7, UK Red, Wales Amber	Confirmed breeder
Mistle Thrush	<i>Turdus viscivorus</i>	UK Red, Wales Amber	Possible breeder
Robin	<i>Erithacus rubecula</i>		Confirmed breeder
Whinchat	<i>Saxicola rubetra</i>	UK Red, Wales Red	Non-breeding
Dunnock	<i>Prunella modularis</i>	S7, UK Amber	Confirmed breeder
Yellow Wagtail	<i>Motacilla flava</i>	S7, UK Red, Wales Red	Possible breeder
Grey Wagtail	<i>Motacilla cinerea</i>	UK Red, Wales Amber	Possible breeder
Pied Wagtail	<i>Motacilla alba</i>		Possible breeder
Goldfinch	<i>Carduelis carduelis</i>		Possible breeder
Siskin	<i>Carduelis spinus</i>		Non-breeding. Flying over.
Greenfinch	<i>Chloris chloris</i>	Wales Amber	Possible breeder

Table 4, summary of breeding bird survey results

***Key to Status Column** Sch1 = Included on *Schedule 1* of the *Wildlife and Countryside Act 1981*, as amended. S7 = Included in *Section 7* of the *Environment (Wales) Act 2016*. UK Red = Included on the current Birds of Conservation Concern 4 Red List (Eaton *et al.* 2015). UK Amber = Included on the current Birds of Conservation Concern 4 Amber List (Eaton *et al.* 2015). Wales Red = Included on the current Birds of Conservation Concern in Wales Red List (Johnstone & Bladwell 2016). Wales Amber = Included on the current Birds of Conservation Concern in Wales Amber List (Johnstone & Bladwell 2016).

Confirmed use of the survey site

- 5.56. 48 species were recorded during the bird survey from the survey site or flying over it. A further four species were recorded from habitat immediately adjacent to the application site (Cormorant *Phalacrocorax carbo*, Moorhen *Gallinula chloropus*, Bullfinch *Pyrrhula pyrrhula* and Willow Warbler *Phylloscopus trochilus* – the latter two species could potentially nest within the

application site and are priority species). Eight species were confirmed to have bred within the survey site with a further four probable breeding species, and 27 are considered to be possible breeding species where conclusive evidence was not recorded.

- 5.57. One species listed on *Schedule 1* of the *Wildlife and Countryside Act 1981* (as amended) was recorded during the bird survey: Hobby. The Hobby is categorised as a possible breeding species, typically nesting in trees or in open areas on the edge of woodlands, with most utilising old crow nests.
- 5.58. Of the 48 species recorded, 21 are priority species. These priority species are as follows:
- **Confirmed breeder:** Kestrel, Whitethroat, Song Thrush, Dunnock.
 - **Possible breeder:** Mallard, Hobby, Lapwing, Stock Dove, Green Woodpecker, Skylark, Long-tailed Tit, Mistle Thrush, Yellow Wagtail, Grey Wagtail, Greenfinch.
 - **Non-breeder:** Black-headed Gull, Lesser Black-backed Gull, Herring Gull, Swift, House Martin, Whinchat.
- 5.59. Bullfinch and Willow Warbler are priority species and were recorded from habitat directly adjacent to the survey site. Both could potentially nest within the application site utilising dense scrub, hedgerows and woodland undergrowth.

Wintering/passage

- 5.60. Some of the birds listed in Table 4 above may be considered as 'resident' at the application site. The application site provides wintering opportunities for a range of birds particularly those associated with arable fields, rivers, scrub and hedgerows. The arable fields could support a number of birds during the winter depending on the level of use of herbicides/ pesticides and their management at the time. Based on the records provided by Cofnod this could include Lapwing, Golden Plover *Pluvialis apricaria*, Skylark, Meadow Pipit *Anthus pratensis*, various finches including Linnet *Linaria cannabina*, buntings including Yellowhammer *Emberiza citrinella*, winter thrushes, House Sparrow *Passer domesticus* and possibly Tree Sparrow *Passer montanus*.
- 5.61. Winter thrushes – Redwings *Turdus iliacus* and Fieldfares *Turdus pilaris* as well as immigrant Blackbirds, etc – are also likely to find a food source associated with berry-bearing shrubs. This resource is likely to be limited within the application site at present as many of the hedges are young. The habitat outside the application site, along the disused railway, may be of particular value.
- 5.62. Areas of long grassland and scrub may support wintering passerines and may be of particular value to seed and fruit-eating species. This may include various finches and buntings. This

habitat is also likely to support good numbers of invertebrates and as such may be important for insectivorous species. The River Clywedog may support small numbers of wildfowl including Mallard.

- 5.63. Small numbers of Woodcock *Scolopax rusticola* and Snipe *Gallinago gallinago* may find feeding opportunities along the river corridor and other wet areas of the application site.
- 5.64. Any congregation of larger birds at the application site could potentially attract a hunting Peregrine *Falco peregrinus* though this is unlikely to be a frequent event.
- 5.65. Various Gulls could loaf on the arable fields, particularly when crop heights remain low (e.g. mostly in the winter).
- 5.66. Due to the different habitats available and feeding opportunities the application site will be used by a number of birds during passage migration. Some of the species mentioned above may also be recorded on passage migration along with species that may only be present briefly, to feed, and then move on to their breeding/wintering grounds. Such migrants could include species such as Wheatear *Oenanthe oenanthe*, Redstart *Phoenicurus phoenicurus* and a number of other passerines.

Great crested newts

- 5.67. There are no ponds within the survey site and 30 ponds within 250m, which for the size of the development and nature of terrestrial habitat on the site, is a sufficient distance to consider for assessment (Appendix K). Twenty-six of these have been assessed in detail. In addition, a dry depression was located in the woodland to the southwest of pond 22, although it appeared to not have held water for a considerable period of time. Please refer to Appendix O for the descriptions of the ponds and their immediate surrounding habitats.
- 5.68. The mosaic of terrestrial habitats across the site including ephemeral, scrub, tall herb/ruderal and grassland were considered suitable for great crested newts ("GCN"), with rubble and brick piles providing potential hibernacula locations.
- 5.69. Wrexham is considered to be of national importance for GCN. There are numerous records for great crested newt within 1km of the site and several for the individual ponds within 250m of the site. In addition, there is a terrestrial record from 2016 for a sub-adult on the southern edge of the track. It is considered that due to the proximity of the waterbodies to each other that there is a reasonable certainty of animal interchange between them and therefore a meta-population of GCN exists to the south of the site, possibly spread across two main population centres. There are also numerous records for common amphibians.

- 5.70. Sixteen ponds were assessed as **below average** to **excellent** suitability for GCN (Table 5). Ponds 12, 16 and 24 did not appear to exist, having been dry for a prolonged period of time and ponds 1, 10, 11, 13, 14, 15 and 21 were not assessed in detail, as authorised access to the ponds was not available.
- 5.71. Some of the ponds are mitigation ponds (2, 3, 4, 8, 9 & 14) constructed approximately 10 years ago as compensation for the construction of Sesswick Road. Ponds 3, 7, 20, 17, 18 & 19, are old. Ponds 22 and 23 were 'functional' lagoons within the Welsh Water Site with ponds 25 and 26 understood to be mitigation ponds within the Welsh Water site.
- 5.72. The A525 to the south and Sesswick Way and Bedwell Road to the east act as habitat barriers and ecologically separate the site from four ponds within 250m.
- 5.73. There were two additional ponds identified on the boundary of the 250 buffer zone, but separated from the site by habitat barriers. One was present to the southwest of Pond 21 on the 250m buffer line border, which was south of the A525 road and the other to the east of Pond 7 east of Bedfield Road at grid reference SJ 37442 47716, which held records of GCN adults, eggs and larvae from 1999-2005.

eDNA analysis

- 5.74. Please refer to the text below for a brief summary of the findings and Appendix U or the document titled 'GCN Survey Report – Wrexham 200826' (Greenlight, 2020) for the full survey findings.
- 5.75. Access was permitted to ponds 2, 3, 4, 5, 6, 7, 8, 9, 17, 18, 19, 20, 22, 23, 25 & 26.
- 5.76. Pond water samples were taken on three separate dates in May 2020 in fine and dry weather conditions. The individual sample kit reference numbers and date of sampling are specified in the document titled 'GCN Survey Report – Wrexham 200713 (Greenlight, 2020).
- 5.77. The results of the eDNA survey indicated that ponds 12 ponds (ponds 2-4, 6-9, 17-18, 23 and 25-26) are used by GCN, with a **positive** result and 1-12 positive replicates. The eDNA sample analysis provided by SureScreen Scientifics are summarised in Table 5 and detailed in Appendix N.
- 5.78. The results are caveated with reference to the limitations and constraints described in section 1.40, where in some instances for some ponds, less than 80% of the shoreline was accessible.

Pond	1	2	3	4	5	6	7	8	9	10	11
Geographic location	No authorised access	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A	Zone A	No authorised access	No authorised access
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Pond surface area (m ²)		300m ²	550m ²	200m ²	300m ²	350m ²	300m ²	100m ²	200m ²		
		0.60	1.00	0.40	0.60	0.70	0.60	0.20	0.40		
Desiccation rate		Never	Never	Never	Never	Never	Never	>3 years in 10	>3 years in 10		
		0.90	0.90	0.90	0.90	0.90	0.90	0.50	0.50		
Water quality/invert density		Good	Good	Good	Good	Good	Good	Good	Good		
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Shoreline shade (%)		50%	50%	30%	30%	80%	50%	70%	70%		
		1.00	1.00	1.00	1.00	0.60	1.00	0.80	0.80		
Waterfowl impacts		Absent	Minor	Absent	Absent	Absent	Absent	Absent	Absent		
		1.00	0.67	1.00	1.00	1.00	1.00	1.00	1.00		
Fish impacts		Absent	Minor	Absent	Absent	Absent	Absent	Absent	Absent		
		1.00	0.67	1.00	1.00	1.00	1.00	1.00	1.00		
Ponds within 1km		13+	13+	13+	13+	13+	13+	13+	13+		
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Terrestrial habitat quality		Good	Good	Good	Good	Good	Good	Good	Good		
		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Macrophyte cover (%)		60%	10%	80%	80%	50%	50%	70%	70%		
		0.90	0.40	1.00	1.00	0.80	0.80	1.00	1.00		
HSI Score		Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Excellent		
		0.93	0.83	0.90	0.94	0.88	0.91	0.77	0.83		
eDNA result	-	Positive	Positive	Positive	Negative	Positive	Positive	Positive	Positive	-	-
Cofnod GCN results	-	Adults and larvae 2005-2015	3 males 2017	Adults 2017-2019	Adults and larvae 2014-2019	Adults 2015	Adults 2015	Adults and larvae 2014-2017	Adults and larvae 2014-2017	Adults, larvae and eggs 2000 Adults 2001-2009	Adults, larvae and eggs 2000 Adults 2001-2009

Pond	12	13	14	15	16	17	18	19	20	21	22
Geographic location	Dry	No authorised access	No authorised access	No authorised access	Dry	Zone A	Zone A	Zone A	Zone A	No authorised access	Zone A
Pond surface area (m ²)						1.00	1.00	1.00	1.00		1.00
Desiccation rate						700m ²	600m ²	350m ²	800m ²		3,000m ²
Water quality/invert density						1.00	1.00	0.70	0.99		0.80
Shoreline shade (%)						Never	Never	Never	Never		Never
Waterfowl impacts						0.90	0.90	0.90	0.90		0.90
Fish impacts						Good	Good	Good	Good		Moderate
Ponds within 1km						1.00	1.00	1.00	1.00		0.67
Terrestrial habitat quality						50%	80%	40%	50%		30%
Macrophyte cover (%)						1.00	0.60	1.00	1.00		1.00
HSI Score						Absent	Absent	Absent	Absent		Minor
						1.00	1.00	1.00	1.00		0.67
						Absent	Absent	Absent	Absent		Absent
						1.00	1.00	1.00	1.00		1.00
						13+	13+	13+	13+		13+
						1.00	1.00	1.00	1.00		1.00
						Good	Good	Good	Good		Good
						1.00	1.00	1.00	1.00		1.00
						20%	10%	10%	10%		30%
						0.50	0.40	0.40	0.40		0.60
						Excellent	Excellent	Excellent	Excellent		Excellent
						0.92	0.86	0.84	0.90		0.85
eDNA result	-	-	-	-	-	Positive	Positive	Negative	Negative	-	Negative
Cofnod GCN results	Adults and eggs 1999-2000	Adults and larvae 2013-2015	Adults and juveniles 2014-2017	Adults 2014-2015	-	Male and female 2000 and 2017	Present 1992-2000	Adults 2014-2015 and before 2003	-	-	Adult 2002

Pond	23	24	25	26	Pond on 250m buffer. Grid ref: SJ 37442 47716
Geographic location	Zone A	Dry	Zone A	Zone A	Not assessed
	1.00		1.00	1.00	
Pond surface area (m ²)	2,500m ²		50m ²	100m ²	
	0.80		0.10	0.20	
Desiccation rate	Never		Dries annually	Sometimes dries	
	0.90		0.10	0.50	
Water quality/ invert density	Poor		Moderate	Moderate	
	0.33		0.67	0.67	
Shoreline shade (%)	5%		0%	40%	
	1.00		1.00	1.00	
Waterfowl impacts	Minor		Absent	Absent	
	0.67		1.00	1.00	
Fish impacts	Minor		Absent	Absent	
	0.33		1.00	1.00	
Ponds within 1km	13+		13+	13+	
	1.00		1.00	1.00	
Terrestrial habitat quality	Good		Good	Good	
	1.00		1.00	1.00	
Macrophyte cover (%)	10%		50%	40%	
	0.40		0.80	0.70	
HSI Score	Good		Below average	Good	
	0.72		0.59	0.74	
eDNA result	Positive	-	Positive	Positive	-
Cofnod GCN results	-	-	-	-	Adults, eggs, larvae – 30 records from 1999-2015

Table 5, HSI score, eDNA results and historic data summary for ponds within 250m of the proposed site.

Water voles and otters

- 5.79. The River Clywedog adjacent the northern boundary is considered suitable for both water voles and otters, although no burrows, holts or signs of use were observed during the site visit.

Reptiles

- 5.80. The grassland, mature woodland and scrub mosaic to the south, southwest and southeast of the site, predominately around the waterbodies, tracks tall grassland/ruderal vegetation and woodland edge is suitable for reptile species including grass snake, adder and slow worm. The variance in vegetation structure and uneven ground provides a good mosaic of habitat for foraging, basking and hibernation potential. Although the site is set within a relatively arable setting, the main study area is linked to a variety of habitats via hedgerows.

Presence/likely absence surveys

- 5.81. Please refer to the text below for a brief summary of the findings and Appendix V 'Reptile Survey Report – Wrexham 200826' (SCALES Consultancy Ltd., 2020b) for the full survey findings.
- 5.82. The presence/likely absence survey recorded no reptiles within the survey area (Table 6). Due to weather, timing and security/access difficulties, each refugia was visited a total of seven times over a grant total of nine visits on nine separates dates to the site.
- 5.83. Although no reptiles were recorded during the surveys, there are known records for the site and so measures to avoid harm, injury and/or killing reptiles will be necessary.
- 5.84. A total of five great crested newts and four common toads were recorded during the surveys.

Visit	Date	Time	Conditions		Results
1	20/07/20	09:00-10:15	Temp Precipitation	16-17°C Dry	No reptiles
2	21/07/20	09:00-11:15	Temp Precipitation	15°C Dry	No reptiles
3	28/07/20	08:40-11:15	Temp Precipitation	15°C Dry	No reptiles
4	03/08/20	08:30-11:40	Temp Precipitation	16°C 5 minutes of drizzle at 09:45	No reptiles
5	12/08/20	08:00-11:25	Temp Precipitation	19-27°C (forecasted to be 18-22°C) Dry	No reptiles
6	15/08/20	08:20-11:10	Temp Precipitation	16-18°C Light mist	No reptiles
7	20/08/20	08:25-11:15	Temp Precipitation	17-19°C Dry	No reptiles

Visit	Date	Time	Conditions		Results
8	24/08/20	09:40-10:45	Temp Precipitation	16-18°C Dry	No reptiles
9	26/08/20	14:30-17:45	Temp Precipitation	20-19°C Dry	No reptiles

Table 6, survey conditions and results of reptile surveys.

Badgers

- 5.85. The habitats on site are considered suitable for badger setts, foraging and commuting. Although no badger setts were recorded during the site visit, well-worn pathways were observed (TN1 and TN5). However, it should be noted that not all areas of the woodland and scrub was accessed and therefore there is the possibility that setts could be present within the dense and remote areas of vegetation on site.
- 5.86. Habitats within the local vicinity include arable fields, neutral grassland, scrub, hedgerows and broadleaves woodland providing further suitable foraging and commuting habitats.

Invertebrates

- 5.87. Although no specific invertebrate survey has been undertaken, the habitats on site provide potential habitat for a variety of common species.
- 5.88. The following species were recorded within the grassland outside of the proposed boundary around ponds four and six: common blue *Polyommatus icarus*, orange tip *Anthocharis cardamines* and peacock *Aglais io*.

Summary of Baseline Ecological Receptors

- 5.89. The following ecological receptors have been identified (Table 7) to have a realistic potential of experiencing an impact as a result of the proposed development.

Ecological receptor	Conservation status	Site Status	Conservation value
River Dee (SSSI)	Statutory status under section 28 of the WCA 1981. Material consideration for local authority.	2.0km southeast of site.	National
River Dee & Dala Lake (SAC)	Statutory status under section 28 of the WCA 1981. Material consideration for local authority.	2.0km southeast of site.	National
Marchwiell Marsh (WS)	No statutory status.	0.5km west of site.	County

Ecological receptor	Conservation status	Site Status	Conservation value
	Material consideration for local authority.		
Cefn Park (WS)	No statutory status. Material consideration for local authority.	1.5km north of site.	County
Peter's Dingle (WS)	No statutory status. Material consideration for local authority.	1.5km east of site.	County
Wrexham Industrial Estate (WS)	No statutory status. Material consideration for local authority.	1.8km northeast of site.	County
Hopyard Wood (WS)	No statutory status. Material consideration for local authority.	1.9km south of site.	County
Habitats	Site consists predominantly of arable fields, with peripheral hedgerows and mature trees. Adjacent habitats comprised broadleaved woodland, ponds, scrub and grassland. NERC Act (2006) habitats on site include: hedgerows.	NERC hedgerow on boundaries not classified as "important" under Hedgerow Regulations 1997.	Site
Bats	Schedule 2 of Conservation of Species and Habitats Regulations 2010 and Schedules 5 and 6 of WCA 1981.	High bat roosting potential in building. High bat roosting potential in mature trees located on site. Aerial and presence/absence surveys found no bats to be roosting in either T8a or T11b. Low to high value commuting and foraging habitat on site, used by at least five bat species.	Local/parish
Birds	WCA 1981. Different species have varying levels of protection and are of varying conservation concern.	Breeding habitat within scrub, hedgerows, trees, building and grassland. Nesting potential for 15 priority species confirmed to either breed or possible breed on site. A further seven and nine priority species considered 'quite likely' and 'less likely' respectively to find nesting opportunities on site.	Local/parish

Ecological receptor	Conservation status	Site Status	Conservation value
Great Crested Newts	Schedule 2 of the Conservation of Species and Habitats Regulations 2010 and Schedules 5 and 6 of the WCA, 1981.	No aquatic habitats and some suitable terrestrial habitats on site. GCN recorded immediately adjacent southern boundary. 16 ponds assessed as below average to excellent suitability for GCN, three ponds dry and seven ponds authorised access refused. Four ponds ecologically separated. eDNA survey indicated 12 ponds are currently used by GCN. Reptile presence/absence surveys recorded five GCN on site.	National
Water voles and otters	Water vole – Schedule 2 of WCA 1981. Otters – Schedule 5 of WCA 1981.	Suitable water vole and otter habitat adjacent northern boundary.	Site
Reptiles	Section 9 of the WCA (1981).	Some suitable habitats on site. Presence/absence surveyed recorded no reptiles on site.	Local/parish
Badgers	Protection of Badgers Act, 1992.	Habitats suitable for badger setts, foraging and commuting. Site and surrounding landscape used by foraging and commuting badgers.	Local/parish
Invertebrates	WCA 1981 and NERC 2006. Different species have varying levels of protection and are of varying conservation concern.	Habitats suitable for a variety of common species.	Site
Small terrestrial mammals (e.g. hedgehog)	BAP target species.	Small numbers of some terrestrial mammals will be present on the site.	Site

Table 7, Summary of ecological baseline receptors.

6. POTENTIAL ECOLOGICAL IMPACTS

- 6.1. This section identifies and assesses the potential impacts of the proposal upon those ecological receptors identified in the baseline evaluation prior to any mitigation measures being implemented. The potential impacts on ecological receptors during construction and operation of the proposals are identified and described in terms of potential magnitude and probability.
- 6.2. Potential impacts during construction include:
- Direct harm from construction machinery.
 - Pollution and waste during construction.
 - Loss of habitat during construction works (this impact would continue into the operation phase of the development).
 - Reduction in quality of neighbouring habitat (through disturbance) during construction works.
- 6.3. Potential impacts during operation include:
- Disturbance from operational activities.
 - Pollution and waste from operation of the site.
 - Disturbance from vehicular access activities.
 - Loss of habitats occupied by the development (a continuation of the impact during the construction phase).

Protected sites

- 6.4. The development footprint falls outside all identified protected sites (statutory and non-statutory). There are two statutory protected sites and five non-statutory protected sites located within 2km of the site.
- The closest statutory protected site (River Dee SSSI), is located approximately 2km southeast of the site and is designated for its transition through a range of river types.
 - The closest non-statutory protected site (Marchwiell Marsh WS), is located approximately 0.5km west of the site and is designated for its marshy field.
- 6.5. The proposed development falls outside of any SSSI Impact Risk Zones.
- 6.6. The proposed development will have no effects on statutory protected sites or their qualifying features, owing to its distance to protected sites and limited impacts beyond the area of works.
- 6.7. **Neutral** impacts on designated sites are considered **certain** during the construction and use of the glasshouse.

Habitats

- 6.8. The habitats on the site are of **low** ecological value, being mainly arable land with peripheral hedgerows and mature trees. However, the track dividing the two field compartments is considered an important linear corridor.
- 6.9. Priority Habitats to occur on site include: hedgerows, which are not classified as “important” under the Hedgerow Regulations 1997.
- 6.10. None of the flora species recorded during the survey are specifically protected by the Wildlife and Countryside Act (“WCA”) 1981 (as amended) or considered rare nationally or locally (e.g. *Preston et al.* 2002).
- 6.11. The proposed works will require the clearance of vegetated habitats on site, including the permanent loss of ≈21.75ha of arable land, ≈95m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees, and the temporary disturbance of ≈0.87ha of arable land, ≈0.88ha of grassland/ruderal mosaic, ≈0.2ha of scrub and ≈30m of species-poor hedgerow (Priority Habitat).
- 6.12. Prior to mitigation, **intermediate negative** impacts on terrestrial habitats are **certain** at a site level.

Bats

- 6.13. Building one will not be directly affected by the proposed works, but has the potential to be temporarily disturbed by the installation of the pipe trench nearby. Prior to mitigation, **minor negative** impacts on bat roosts within buildings are **certain**.
- 6.14. Although a number of mature trees located on the site were assessed as having **high** roost suitability for bats, an aerial inspection and presence/absence surveys confirmed the likely absence of bats roosting within T8a, T11a and T11b. Under the current proposals it is not known whether T8a will be directly affected by the proposed works, with T11a and T11b being removed, which could directly impact bats and their habitat. T11a and T11b are set in the middle of an arable field approximately 100m from the field boundary hedgerows. The isolation of the trees may reduce the likelihood of use by roosting bats. The remainder of the trees will be subject to indirect impacts (e.g. noise and light levels) through the construction and operation of the site. Prior to mitigation, **minor negative** impacts on bat roosts within trees are **certain**.
- 6.15. Foraging and commuting areas for bats will be directly affected (permanent loss of ≈95m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees, and the temporary disturbance of ≈30m of species-poor hedgerow (Priority Habitat)) and indirectly

(increase noise and light levels) affected. Prior to mitigation, **minor negative** impacts on bat foraging and commuting are **certain**.

Birds

- 6.16. The site provides suitable nesting habitats for scrub, hedgerow, tree, building and certain ground nesting species. Although 15 priority species were confirmed to either breed or possibly breed on site, a further seven and nine priority species were considered '*quite likely*' and '*less likely*' respectively to find nesting opportunities within the site. Barns owls may nest in mature trees on site and forage over marginal habitats.
- 6.17. The proposed works likely to impact upon breeding birds include the clearance of vegetated habitats on site (i.e. the permanent loss of ≈ 21.75 ha of arable land, ≈ 95 m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees, and the temporary disturbance of ≈ 0.87 ha of arable land, ≈ 0.88 ha of grassland/ruderal mosaic, ≈ 0.2 ha of scrub and ≈ 30 m of species-poor hedgerow (Priority Habitat)), resulting in the loss of bird nesting habitats.
- 6.18. Building one will not be directly affected by the proposed works, but has the potential to be temporarily disturbed by the installation of the pipe trench nearby.
- 6.19. Prior to mitigation, **minor negative** impacts on breeding birds of conservation concern are **certain**.

Great crested newts

- 6.20. Certain terrestrial habitats on site are considered suitable for GCN, comprising of a mosaic of ephemeral, scrub, tall herb/ruderal and grassland.
- 6.21. A known population of GCN is present to the south of the proposed site. The proposed development area is likely to provide some terrestrial habitat including corridors of dispersal.
- 6.22. The proposed works which involve the clearance of vegetated habitats on site (i.e. the permanent loss of ≈ 21.75 ha of arable land, ≈ 95 m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees, and the temporary disturbance of ≈ 0.87 ha of arable land, ≈ 0.88 ha of grassland/ruderal mosaic, ≈ 0.2 ha of scrub and ≈ 30 m of species-poor hedgerow (Priority Habitat)), involve a risk of injuring or killing individual GCN potentially present within the site.
- 6.23. Prior to mitigation, **intermediate negative** impacts on great crested newts are **certain**.

Water voles and otters

- 6.24. Although the River Clywedog adjacent the northern boundary provides suitable habitat for water voles and otters, it will not be directly impacted by the proposed development.
- 6.25. Therefore, we predict **neutral** impacts on water voles and otters are **probable**.

Reptiles

- 6.26. Certain habitats on site are considered suitable for reptiles, comprising of a mosaic of ephemeral, scrub, tall herb/ruderal and grassland.
- 6.27. As grass snakes have been recorded locally within the vicinity of ponds 13, 14 and 15, individual reptiles may commute onto or across site. The proposed works which involve the clearance of vegetated habitats on site (i.e. the permanent loss of ≈ 21.75 ha of arable land, ≈ 95 m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees, and the temporary disturbance of ≈ 0.87 ha of arable land, ≈ 0.88 ha of grassland/ruderal mosaic, ≈ 0.2 ha of scrub and ≈ 30 m of species-poor hedgerow (Priority Habitat)), involve a risk of injuring or killing individual reptiles potentially present within the site.
- 6.28. Prior to mitigation, **minor negative** impacts on reptiles are **certain**.

Badgers

- 6.29. The site provides suitable habitats for badger setts, foraging and commuting. Although a number of mammal pathways were present on site, no badger setts or evidence was observed within a reasonable distance of the proposed works, which may cause an offence under The Protection of Badgers Act 1992.
- 6.30. The proposed works which involve the clearance of vegetated habitats on site (i.e. the permanent loss of ≈ 21.75 ha of arable land, ≈ 95 m of species-poor hedgerow (Priority Habitat) and a small number of scattered mature trees, and the temporary disturbance of ≈ 0.87 ha of arable land, ≈ 0.88 ha of grassland/ruderal mosaic, ≈ 0.2 ha of scrub and ≈ 30 m of species-poor hedgerow (Priority Habitat)) is of suboptimal foraging value to badgers and adequate similar habitat is available in the local area.
- 6.31. Construction activities are proposed to occur during daytime and highly unlikely to have any impact on badgers, which are a mainly nocturnal species.
- 6.32. We predict **neutral** impacts on any **local** badger population as a result of the proposed development, which are **probable**.

Invertebrates

- 6.33. The site consists predominantly of arable fields, with peripheral hedgerows and mature trees. These habitats are common and widespread and unlikely to support Nationally Scarce or Species of Principal Importance.
- 6.34. Therefore, we predict **neutral** impacts on invertebrates that are **certain**.

Small terrestrial mammals

- 6.35. Widespread species such as hedgehog *Erinaceus europaeus* are likely to be present on the site. Prior to mitigation, **minor negative** impacts on small mammals are **certain** during construction and operation of the proposed development.

7. MITIGATION AND ENHANCEMENTS

- 7.1. Mitigation measures are proposed to address the potential impacts on ecological receptors and to enhance the site habitats.

Habitats

- 7.2. As mitigation for the loss of habitats, the following is recommended:
- i. The site's habitat biodiversity should be enhanced through a soft landscaping scheme, including the planting of new species-rich hedgerows, trees, scrub and grassland across and around the site to create a 'green buffer' zone and compensate for those lost. Please refer to Appendix J for the proposed mitigation scheme. A list of suitable native species for planting and sowing is provided in Appendix H.
 - ii. The proposed scheme includes the creation of two reservoirs ($\approx 2.3\text{ha}$) and 12 new ponds ($\approx 0.31\text{ha}$), with the latter specifically managed for GCN.
 - iii. Construction works are carried out in accordance with British Standards Institution (2012), BS 5837:2012, Trees in relation to design, demolition and construction – recommendations, to protect trees which are to be retained and their root protection areas.
 - iv. Construction work is carried out in accordance with British Standards Institution (2013), BS 42020:2013, *Biodiversity – Code of Practice for planning and development*, to protect waterways (the River Clywedog) from runoff and pollution via the implementation of a Construction Environmental Management Plan ("CEMP").
 - v. General best practice measures should be implemented during the construction phase to avoid any indirect impacts (*e.g.* dust, diffuse pollution, etc.) on adjacent habitat. The general advice contained in the Guidance for Pollution Prevention (GPP) leaflets produced by SEPA, EA and the Environment and Heritage Service (Northern Ireland) should be adhered to, particularly the following:
 - PPG1: Understanding Your Environmental Responsibilities - Good Environmental Practices.
 - GPP5: Works and Maintenance in or Near Water.
 - PPG6: Working at Construction and Demolition Sites.

Bats

- 7.3. The following mitigation is recommended to avoid impacts on bats from the proposed works:

- i. Temporary disturbance work around building one should be conducted and completed outside the main bat maternity season, ideally between September and April.
- ii. If proposed works change to directly affect building one, assessed as high bat roosting potential, further bat surveys should be conducted prior to work commencing, to assess its potential use by bats.
- iii. T8a and T11b should be felled under supervision of a licenced bat ecologist, and aerially inspected immediately prior to felling.
- iv. Trees to be removed should be soft felled during September or October. This is where the tree limbs are cut, slowly lowered to the ground and left overnight with roosting features pointing upwards, to allow any roosting bats the opportunity to disperse.
- v. Lighting schemes should follow guidance from the Bat Conservation Trust and CIE 150:2003. Warm-white (long wavelength) lights with UV filters should be fitted as close to the ground as possible. Lighting units should be angled below 70° and equipped with movement sensors, baffles, hoods, louvres and horizontal cut off units at 90°.
- vi. To maintain existing foraging and commuting routes, no lighting should be situated along the periphery of the site or within/adjacent the 'green buffer' zone.
- vii. The site's habitat biodiversity should be enhanced through a soft landscaping scheme, including the planting of new species-rich hedgerows, trees, scrub and grassland across and around the site to create a 'green buffer' zone and compensate for those lost. Please refer to Appendix J for the proposed mitigation scheme. A list of suitable native species for planting and sowing is provided in Appendix H.

7.4. As enhancements, we recommend the installation of:

- i. 20 standalone bat boxes (a mixture of Schwegler 2F and 1FF Bat Box with built-in wooden rear panel – Appendix E).

7.5. After the effects of the above mitigation and enhancements, we consider that the favourable conservation status of the local bat population will be maintained.

Birds

- 7.6. Although the bird survey report (Marches Ecology, 2020) recommended further surveys to confirm the breeding bird assemblages on site, the mitigation detailed below is considered to be prudent based on the survey results, and to provide adequate compensation and enhancement of habitats for birds on the site.
- 7.7. The following mitigation is recommended to avoid impacts on birds from the proposed works:

Best practice:

- i. Any works affecting bird nesting habitat such as management of grassland, scrub, hedgerows, trees or buildings to be conducted outside the main nesting season, which lasts from March to August. If work is planned during the bird nesting season then a precautionary check of all habitats, should be conducted by a qualified ecologist immediately prior to starting any work. If any nesting birds are found, an appropriate protection zone from the nest will be required and should be maintained until the young have fledged.
- ii. Any site compound required during the construction phase should be located well away from the tree at T8a, the River Clywedog and any other habitat features that might be used by nesting birds.
- iii. To minimise potential impacts on birds nesting near to the proposed development there should be no night-time working either during the construction or operation phases. A vehicle speed limit should also be enforced during both construction and operation phases.
- iv. If proposed works change to directly affect building one or the River Clywedog, further surveys should be conducted prior to work commencing, to assess their potential use by barn owls and kingfishers respectively.
- v. The site's habitat biodiversity should be enhanced through a soft landscaping scheme, including the planting of new species-rich hedgerows, trees, scrub and grassland across and around the site to create a 'green buffer' zone and compensate for those lost. Please refer to Appendix J for the proposed mitigation scheme. A list of suitable native species for planting and sowing is provided in Appendix H.

Nest boxes:

- i. Three kestrel nest boxes (Nest Box – Appendix E) should be provided.
- ii. At least 20 small bird boxes should be installed and include a mixture of Schwegler 1B (both 26 mm and 32 mm entrance holes), 2H, 2GR and 3SV (Appendix E).
- iii. All nest boxes should be installed either by a suitably qualified ecologist or under their supervision. They should also be subject to annual maintenance and monitoring.

Bird/glass collisions

- 7.8. The bird survey report discusses potential risk to birds from collisions with glass buildings. Considering the relatively low height of the glasshouses to eaves/gutter level of 7m, the risk of

individual birds colliding with the glasshouse is considered insignificant to the local bird population. The glasshouse is covered in a single layer of glazing, which reduces the risk of bird strikes compared to double glazing on typical installations, owing to lower light reflection levels. In addition, the landscape and planting strategies have been designed to avoid funnelling birds towards the glasshouse, with buffer zones between hedgerows, trees and the glasshouses to minimise the risk of collisions.

Great crested newts

- 7.9. Owing to the large number of ponds within 250m, historic and recent GCN records, there is predicted to be a large population of GCN, possibly of national significance, within 250m of the proposed site. To assist in the determination of an appropriate mitigation strategy, ponds within 250m were subjected to eDNA surveys to confirm GCN presence/likely absence, with 12 ponds returning a positive result.
- 7.10. In order to be able to proceed with the proposed works and to ensure that no detrimental impacts will result on the species, a European Protected Species mitigation licence from Natural Resources Wales will be required for the proposed works.
- 7.11. *Draft Supplementary Planning Guidance Note 35: Great Crested Newt Mitigation Requirements – Johnstown Newt Site SAC and the Wider Countryside* provides advice and guidance to developers, land owners, members and other local authority council officers when assessing development proposals involving, or in close proximity to GCN populations, together with other material planning considerations.
- 7.12. Mitigation options currently being pursued include on-site and off-site mitigation (detailed below) and a financial contribution towards GCN mitigation off-site in lieu of onsite provisions in accordance with the Great Crested Newt Mitigation Requirements – Johnstown Newt Site SAC and the Wide Countryside.
- i. The creation of an amphibian receptor area ('mitigation area') and 'green buffer' zones in the northwest field and to the east and south of the proposed glasshouse (totalling ≈7.7ha). The scheme will include terrestrial and aquatic habitats. These areas are currently intensively managed arable farmland, bordered on the north by mature woodland and a river corridor, with grassland and scrub to the south. Please refer to Appendix J for the proposed mitigation scheme.
 - a. Terrestrial habitats should consist of a species-rich rough grassland (≈6.44ha), with scrub (≈0.33ha) and woodland (≈0.62ha) planting, and the creation of 10, 25m south facing bunds/hibernacula (Appendix F) that are covered in low-nutrient soils. These

- bunds will create variation in site topography and provide varying microclimates for amphibians.
- b. The planting of a new species-rich (≥ 5 native species) hedgerow and tree belt, measuring $\approx 565\text{m}$ and $\approx 325\text{m}$ along the western and northern boundaries of the proposed glasshouse respectively. A list of suitable native species for planting and sowing is provided in Appendix H.
 - c. Habitat corridors to be maintained and encourage dispersal from the south. A track of 565m in length and about 5m wide (0.32ha) consisting of a modified tall ruderal grassland mosaic and a hedgerow to be retained and protected between the two arable fields.
 - d. Aquatic habitats should consist of the creation of 12 new ponds split into three clusters. The ponds should have a surface area of $100\text{--}300\text{m}^2$ (totalling $\approx 0.31\text{ha}$), with a maximum depth of 2.5m , gradually sloping sides and a 1m deep shelf on the southern section to provide breeding areas for newts. No fish are to be released into the ponds.
- ii. A temporary exclusion fencing with pitfall traps (100 traps/ha) to be installed around the site perimeter and checked for a minimum of 60 nights, in suitable weather conditions and during the active season for amphibians (March to October). Any animals caught are to be translocated to the designated receptor area. The fence will remain in situ during the construction period to prevent amphibians moving back into the area of works.
 - iii. During the trapping period, night searches will be conducted by a licenced ecologist. The search will involve a thorough inspection of the site using high powered torches for active amphibians approximately an hour after sunset.
 - iv. Phased vegetation clearance conducted during the defined trapping period. The initial cut should be to a height of 10cm , with subsequent cuts once a week to maintain sward height.
 - v. A hand destructive search of all suitable amphibian habitat to take place at the end of the trapping period, under watching brief by a licensed GCN ecologist. Any animals caught are to be translocated to the designated receptor area.
 - vi. Storage of building materials to be raised from the ground on pallets to avoid providing potential resting places for amphibians.
 - vii. Any excavations should have a rough sawn plank placed inside to act as a ramp to allow any animals that have fallen in to escape. The excavations should be checked each morning works are scheduled for, to remove any animals trapped.

viii. Long-term monitoring of the GCN population in accordance with the Great Crested Newt Mitigation Guidelines (English Nature, 2001).

7.13. Mitigation measures following the works will include the long-term management of the receptor area to maintain the ponds, a species-rich tussocky grassland and limit scrub encroachment:

- i. Once established, an alternating strip method should be used, where one third of the grassland is cut every three years between November and February. Cut alternating strips 1-2m wide across the grassland to a height of 10cm. The following year, cut an adjacent strip in the same way, so that each strip is cut every three years (Edgar *et al.*, 2010).
- ii. Clearing scrub and removing trees which may provide too much shade to the receptor area, particularly on the southern aspect.
- iii. Preserving the suitability of the hibernacula created for amphibians.
- iv. Aquatic vegetation (marginal and submerged) will be maintained between 50-75% by hand during autumn or winter months (ideally September to November) once established. Any vegetation removed from the pond will be left on the bankside for 48 hours to allow any wildlife to return to the water.

7.14. After the effects of the above mitigation, we predict a significant enhancement of the favourable conservation status of GCN on and near the site, and we therefore consider that an EPS mitigation licence should be granted by Natural Resources Wales.

Summary of Habitat Losses, Temporary Disturbance and Creation

Habitat type		Habitat (ha)			
		Losses	Temporary disturbance	Created mitigation area 1	Created mitigation area 2
Aquatic habitats (excluding reservoirs) (ha & No. of newt ponds)		0	0	0.08 (4 ponds)	0.23 (8 ponds)
Terrestrial	Grassland/ ruderal mosaic (ha)	0	0.88	2.61*	3.83*
	Woodland (ha)	0	0	0.21	0.41
	Arable (ha)	21.75	0.87	0	0
	Hedgerow (m)	95**	30	0	565*** 1657 trees and shrubs
	Scrub (ha)	0	0.2	0.33	0
	Woodland belt (m)	0	0	0	325 (36 trees)

	Mature trees	2 (possibly 3)	0	0	See woodland belt
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Table 8, summary of habitat losses, disturbance, creation and enhancement.

* species-rich grassland. ** remnant isolated in centre of arable field. *** outside of mitigation area.

Proposed Targets

- 7.15. The proposed targets for the ponds within the GCN mitigation areas and Ponds to the south of the development are as follows:
- For all new Glasshouse Mitigation Ponds the HSI score should be between Good and Excellent (0.7+).
 - All ponds that supported GCN populations prior to the development should continue to support them at least equal to the population prior to works commencing.
 - All ponds that were created as aquatic mitigation habitat should support GCN populations with a target of 'medium' class size.
 - The overall population level for the new Glasshouse mitigation area and ponds to the south collectively should be greater than the overall population (ponds deemed to be with 250m of each other) and greater than for the metapopulation (ponds deemed to be within 500m of each other) that existed in the south prior to works commencing.

Water voles and otters

- 7.16. As a precautionary measure, the following mitigation is recommended to avoid impacts on water voles and otters from the proposed works:
- A 5m no-work buffer zone (includes vegetation clearance) to be applied from the top of the riverbank, to protect potential water vole burrows and prevent pollution/run-off from entering the watercourse. This area will be marked using a temporary barrier netting.
 - If proposed works change to incorporate this area, further water vole surveys should be conducted prior to work commencing to inform a detailed mitigation strategy.
- 7.17. After these precautionary mitigation measures, we predict no impact on water voles or otters from the development plans. We consider that a European Protected Species Mitigation Licence will not be required, and no further surveys are necessary.

Reptiles

- 7.18. The proposed trapping and exclusion of great crested newts, detailed above, will have the dual purpose of also ensuring that any reptiles present within habitats to be lost or temporarily disturbed will be safely relocated to the mitigation site, which will be designed and created to

serve and support both reptiles and amphibians. Therefore, exclusion of reptiles from the development areas would be undertaken during the great crested newt mitigation work. This exclusion and trapping programme would need to be carried out at an appropriate time of year during periods of reptile and amphibian activity to maximise capture efforts. It is considered appropriate to carry out a reasonable 'capture/release' programme to safeguard reptiles undertaken in advance of the commencement of the development involving the loss of suitable habitats deemed as capable of supporting reptiles during the great crested newt trapping.

Badgers

7.19. Good working practices should be adhered to during any development work. The following mitigation is recommended to avoid impacts on badgers from the proposed works:

- i. Regular checks are undertaken of the site prior to development commencing; badgers are a mobile species and the site occupies a rural location with links to the wider countryside. A badger survey may be necessary if signs of an active sett are found within a distance from construction activities which might damage badger setts.
- ii. The nature of planned works within 30m of badger setts will require assessment for potential impacts on setts, and to inform an appropriate mitigation strategy. This may include further surveys and sett closure under licence.
 - a. Survey methods may include the use of motion activated wildlife camera to record any animals using the setts, and/or the use of 'sticky sticks' on the outside of holes, to catch any hairs from badgers that pass through. The setts should be monitored for an extended period of time (over several weeks).
 - b. Following the surveys, a licence from Natural England may be required to be able to proceed with the works, which may include closure of setts. If there is no alternative to the destruction of active setts, the creation of artificial setts on site may be required prior to excluding badgers from their original setts, using one-way badger gates.
- iii. Any excavations or pipes over 200mm in diameter on the construction site should be filled on the same day as the excavation, capped off or covered during the night with ply/OSB board to prevent animals from falling in.

7.20. After these precautionary mitigation measures, we predict no impact on badgers or their setts as a result of the development plans.

Invertebrates

- 7.21. No impacts are expected on invertebrates from the proposed development and no mitigation is required. Invertebrates will benefit from the soft landscaping scheme included in the proposals.

Small mammals and other animals

- 7.22. Any fencing installed should be porous and provide access opening for hedgerows (see Appendix G for examples).
- 7.23. Any excavations should have a rough sawn plank placed inside to act as a ramp to allow any animals that have fallen in to escape. The excavations should be checked each morning works are scheduled for, to remove any animals trapped.
- 7.24. Lighting of the construction site at night should be minimised as far as practicable, to reduce the risk of possible disruption to nocturnal animals such as bats and badgers.
- 7.25. Construction materials should be stored off the ground on pallets, to prevent providing shelter for animals and subsequent harm when materials are moved.

8. ECOLOGICAL IMPACTS AFTER MITIGATION

- 8.1. The predicted impacts after considering the effects of the proposed mitigation is set out in Table 9 below.

Ecological receptor	Conservation value	Impacts prior to mitigation	Impacts after mitigation
River Dee (SSSI)	National	Neutral - certain	Neutral - certain
River Dee & Dala Lake (SAC)	National	Neutral - certain	Neutral - certain
Marchwiell Marsh (WS)	County	Neutral - certain	Neutral - certain
Cefn Park (WS)	County	Neutral - certain	Neutral - certain
Peter's Dingle (WS)			
Wrexham Industrial Estate (WS)	County	Neutral - certain	Neutral - certain
Hopyard Wood (WS)	County	Neutral - certain	Neutral - certain
Habitats	Site	Terrestrial: Intermediate negative - certain	Terrestrial: Neutral - certain
Bats	Local/parish	Roosting: Minor negative – certain Foraging and commuting: Minor negative - certain	Roosting: Positive impacts provided bat boxes erected - certain Foraging and commuting: Neutral impacts provided mitigation created – certain
Birds	Local/parish	Minor negative - certain	Neutral impacts during construction provided work occurs outside nesting period is certain. Neutral impacts on nesting habitat provided mitigation created – certain
Great Crested Newts	National	Intermediate negative - certain	Positive impacts provided mitigation created – certain
Water voles and otters	Site	Neutral - probable	Neutral - certain
Reptiles	Local/parish	Minor negative - certain	Positive impacts provided mitigation created – certain
Badgers	Local/parish	Neutral - probable	Neutral - certain
Invertebrates	Site	Neutral - certain	Neutral - certain
Small terrestrial mammals (e.g. hedgehog)	Site	Minor negative - certain	Neutral impacts provided any fencing installed is porous is certain.

Table 9, Ecological impacts after mitigation

9. DISCUSSION AND CONCLUSIONS

- 9.1. Prior to mitigation, the construction and operation of the proposed development will have **neutral** effects on the habitats of statutory and non-statutory protected sites in the vicinity.
- 9.2. The habitats on the site are of **low** ecological value, being mainly arable land with peripheral hedgerows and mature trees. However, the track dividing the two field compartments is considered an important linear corridor.
- 9.3. Opportunities for enhancing the site's biodiversity have been identified. The site's habitat biodiversity will be enhanced through a soft landscaping scheme, using native species, which will include the planting and creation of new species-rich hedgerows, trees, scrub, grassland, water features and hibernacula across and around the site to create 'mitigation areas' and 'green buffer' zones. Please refer to Appendix J for the proposed mitigation scheme.
- 9.4. We predict no adverse impacts on protected species, prior to mitigation, rated higher than **intermediate negative**. After mitigation the range of habitat creation and enhancements will benefit a wide range of animals, including bats, breeding birds, amphibians, reptiles and small mammals, providing **neutral** to **positive** impacts.

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Appendix A Methods

Desktop Review

A desktop review of published data, such as records of protected sites and species, OS maps and satellite images has been carried out. A data search was carried out with Cofnod – North Wales Environmental Information Service.

A field survey visit was conducted to confirm the findings of the desktop review and to record habitats and species located on site.

Equipment available for use during the survey were binoculars, ladders, torches, endoscope and a digital camera.

Habitats

The habitats on site have been defined using the Handbook for Phase 1 habitat survey (JNCC, 2010). Natural Environment and Rural Communities (NERC) Act (2006) habitats listed under section 41 have been identified where appropriate.

Bats

An assessment of the habitats on and surrounding the site for bat interest was made, in accordance with latest bat survey guidelines (Collins, 2016).

The building(s) on site was assessed for its potential to support roosting bats and involved a thorough internal and external search of all suitable cavities, holes and crevices. All suitable areas, including objects, ledges and floors were inspected for the following signs:

- Bat droppings
- Stains around roosting places and entrance points
- Urine marks
- Prey remains
- Areas devoid of cobwebs
- Live or dead bats
- Suitable cracks and crevices for bats to enter

In exposed conditions, the signs of bat usage such as droppings and urine marks can be obliterated by heavy rain.

An evaluation system was applied to the building(s) using the following criteria:

- **Negligible roost suitability for bats.** These buildings have no potential roosting features for bats, or very few or minor features in an isolated or unsuitable location such that the presence of a bat roost is considered highly unlikely. Such buildings usually fall into two main types: generally, well maintained without cracks and crevices, no gaps between bargeboard or soffit and wall, or without an attic space;

or those which contain some or all of the above features, but are both draughty and thick in cobwebs or contain strong odours such as solvents, diesel etc. It must be borne in mind that a building from this latter group can become suitable for bats following refurbishment. This often happens to houses once the attic space has been cleaned and under-felted prior to timber treatment. When no suitable habitats for bats are found, no further surveys or European Protected Species ("EPS") mitigation licence are required.

- **Low roost suitability for bats.** Buildings in this category have one or more potential roost sites that could be used by individual bat opportunistically. These buildings do not however provide suitable conditions (such as space, shelter, temperature, humidity, or light and noise disturbance) to be used on a regular basis by a large number of bats. Structures with low roost suitability for bats will require **one dusk emergence or one dawn re-entry survey** conducted between May and August to assess their current use by bats.
- **Moderate roost suitability for bats.** These buildings contain one or more potential roosting sites which could be regularly used by bats owing to their size, shelter, protection and conditions. These buildings are however unlikely to support a roost of high conservation status (maternity roost or hibernation roost). Structures with moderate roost suitability for bats will require two surveys, **one dusk emergence and one dawn re-entry survey** conducted between May and September with at least one of the surveys undertaken between May and August, to assess their current use by bats.
- **High roost suitability for bats.** This group includes buildings with one or more potential roost sites which are obviously suitable for use by a larger number of bats on a regular basis and potentially for longer periods of time owing to their size, shelter, protection and conditions. These buildings may support a roost of high conservation status (maternity roost or hibernation roost) and will require three activity surveys to assess their current use by bats. The surveys should include at least **one dusk emergence and** at least **one dawn re-entry survey** (the third survey can either be at dusk or dawn) and should be conducted between May and September with at least two of surveys undertaken between May and August.

Trees on and around the site were assessed for their suitability to support roosting bats. The assessment involved a ground level inspection of the exterior of the trees to search for features offering roosting potential to bats such as split limbs, woodpecker holes, cavities, lifted bark and dense thick-stemmed ivy.

An evaluation system was applied to the trees using the following criteria:

- **Negligible roost suitability for bats.** Trees unlikely to be used by roosting bats.
- **Low roost suitability for bats.** A tree of sufficient size and age to contain Potential Roosting Features ("PRFs"), but with none seen from the ground or features seen with only very limited roosting potential.
- **Moderate roost suitability for bats.** A tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.

- **High roost suitability for bats.** A tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection and surrounding habitat.

The habitats on and around the site were assessed for their commuting and foraging potential for bats. An evaluation system was applied to the commuting and foraging potential using the following criteria.

- **Negligible commuting and foraging potential for bats.** Habitat features unlikely to be used by commuting or foraging bats.
- **Low commuting and foraging potential for bats.** Habitats that could be used by a small number of commuting or foraging bats such as, a gappy hedgerow, unvegetated stream or lone trees, but are isolated and not well connected to the surrounding landscape.
- **Moderate commuting and foraging potential for bats.** Habitats that are continuous and connected to the wider landscape such as, lines of trees, scrub, linked back gardens, grasslands and water features.
- **High commuting and foraging potential for bats.** Habitats that are continuous and connected to the wider landscape such as, river valleys, watercourses, hedgerows, lines of trees, deciduous woodland, and grazed parkland. These habitats are likely to be used regularly by commuting or foraging bats and are likely to be close to, or connected to, known roosts.

Birds

The site and its surrounding habitats were assessed for their potential to support breeding birds. Bird nesting habitat could include grassland, hedgerows, scrub, trees and buildings.

Bird species noted during the site visit were recorded. Trees, buildings and grassland were checked for use by barn owls swifts and skylarks.

Great crested newts

Habitats on and near the site were assessed for their suitability for great crested newts ("GCN").

Water features on and near the site were assessed for their suitability for occupation by GCN, according to a Habitat Suitability Index ("HSI"). The HSI is a theoretical index of a waterbody's suitability to support a breeding population of GCN and is calculated from a series of ten variables recorded on site, as detailed in Table 10.

Indices	Name	Description
SI1	Geographic Location	Lowland England or upland England, Scotland and Wales
SI2	Pond area	To the nearest 50m ²
SI3	Permanence	Number of years' pond dry out of ten
SI4	Water quality	Measured by invertebrate diversity
SI5	Shade	Percentage shading of pond edge at least 1m from shore
SI6	Fowl	Level of waterfowl use
SI7	Fish	Level of fish population
SI8	Pond count	Number of ponds within 1km divided by 3.14
SI9	Terrestrial habitat	Quality of surrounding terrestrial habitat
SI10	Macrophytes	Percentage extent of macrophyte cover on pond surface

Table 10, HSI indices.

The HSI score is the geometric mean of the ten suitability indices calculated:

$$HSI = (SI1 \times SI2 \times SI3 \times SI4 \times SI5 \times SI6 \times SI7 \times SI8 \times SI9 \times SI10)^{1/10}$$

Once calculated, the HSI score for a waterbody can be categorised as follows:

Excellent (>0.8)

Good (0.7 – 0.79)

Average (0.6 – 0.69)

Below Average (0.5 – 0.59)

Water voles, otters and white-clawed crayfish

Water features on and adjacent to the site were assessed for use by water vole, otter and white-clawed crayfish. Otters in England typically use areas of fresh water and streams and ditches for moving between habitats. Otter holts are usually located underneath tree roots, in tunnels. Field signs of presence include spraints on prominent features such as bridges, tree bases or boulders, and footprints.

Water voles inhabit burrows in the banks of ponds, ditches, streams and rivers. Field signs include droppings left in latrine spots, burrow entrances or feeding remains.

White-clawed crayfish inhabit streams and rivers with a moderate flow rate, and lakes. Clear, well-oxygenated water is preferred. Typical habitat features include crevices in rocks, gaps between stones, submerged plants and tree roots.

Reptiles

The habitats on the site and within the proposed area of works were assessed for suitability for reptiles.

Reptiles rely on conditions that allow them to maintain their body temperature through basking. They require access to direct sunlight, shelter from the elements, sufficiently large populations of prey species and hibernation sites.

Reptiles typically favour a habitat mosaic with a diverse vegetation structure, which could include grassland, scrub and woodland.

Badgers

An inspection of all habitats with the potential to support badger *Meles meles* sett construction and foraging activities on the application site was undertaken. Any incidental observations of badger signs were also recorded. The survey comprised searching for evidence of badger activity in the form of setts, droppings, pathways, snuffle holes, hair and footprints.

Dormice

Dormice habitats include deciduous woodland, hedgerows and scrub. Dormice are found mainly in the south of England, including Kent and Sussex, with sporadic populations elsewhere. An assessment of the suitability of site habitats for occupation by dormice was made.

Other protected species

Particular regard was made to the nature of the proposed development and the potential of impact upon any other protected species, species which are nationally or locally scarce, or species subject to other conservation designations such as Red Data Book or Priority S41 species, from the development work, should these be present in the area.

Constraints

The desk study data is not likely to be exhaustive and is intended mainly to set a context for an ecological study. It is therefore possible that protected species that were not identified during the data search may occur within the vicinity of the proposed development site.

The calculation of HSI values requires detailed knowledge of water quality. Index values for water quality have therefore been inferred from visual observations relating to water clarity and diversity of the invertebrate assemblage.

Appendix B

Protected sites' citations

SSSI Citations

Site name: River Dee (England) **County:** Cheshire/ Shropshire

District: Chester City Council District Council/ North Shropshire District Council

Status: Site of Special Scientific Interest (SSSI) notified under section 28C of the Wildlife and Countryside Act 1981 (as amended)

Local Planning Authorities: Cheshire County Council, Shropshire County Council, Chester City Council District Council, North Shropshire District Council

National Grid reference: SJ417532

Area: 371.50 ha

Ordnance Survey sheet: 1:50,000: 117, 126 1:10,000: SJ23, 26, 33, 34, 44, 45, 46

Date notified (under 1981 Act): 1996

Date of Last Revision: 2 May 2002

Reasons for notification:

The River Dee is notified for its nationally important transition through a range of river types from mesotrophic to eutrophic. It is also notified for Atlantic salmon *Salmo salar*, otter *Lutra lutra*, club-tailed dragonfly *Gomphus vulgatissimus* and fluvial geomorphology.

The River Dee lies within both England and Wales, and is notified as separate SSSIs – the River Dee (England) and the Afon Dyfrdwy-River Dee SSSI in Wales. The features for which the two SSSIs are notified, in particular the range of river types and migratory fish, depend upon the whole river ecosystem. The fluvial geomorphological interest occurs in both England and Wales.

The English sections of the river are therefore notified as components of the whole ecosystem for which the river is a nationally important example, and because the otter, club-tailed dragonfly and the geomorphological interest occurs on the English reaches.

General description:

The River Dee (England) SSSI comprises the part of the river of the same name and the part of its tributary, the Ceiriog, that flow through England. The site includes a section of the river as it meanders across the Cheshire plain down stream from Shocklach, where it forms the national boundary, northwards through Chester to the city's western outskirts. Further up the catchment, the southern half of river channel

of the River Ceiriog located in North Shropshire between Chirk Castle and Erbistock forms part of the SSSI.

The Afon Dyfrdwy-River Dee SSSI has its source in Snowdonia at the outflow of Llyn Tegid SSSI and it includes the Ceiriog, Meloch, Tryweryn and Mynach tributaries. Its catchment contains a wide spectrum of landscape from high mountains around Bala, rugged peaks near Llangollen, steep sided wooded valleys, and the plains of Cheshire and North Shropshire through to the vast mudflats of the estuary. There is a tidal influence as far upstream as Farndon and high tides regularly exceed the Chester weir crest level. It flows through broad valley near Corwen, and through the spectacular Vale of Llangollen before meandering northwards through parts of the Cheshire plain where it joins the River Dee (England) SSSI. Further downstream it includes the stretch below Chester to where the river meets the Dee Estuary.

The River Dee is reputed to be the most regulated river in Europe, with flow controlled by the reservoirs of Tegid, Celyn and Brenig.

Flora

The River Dee (England) is typical of a mesotrophic river. The aquatic plant community includes species of water crowfoot *Ranunculus fluitans x aquatilis* and *Ranunculus peltatus*, and also floating water plantain *Luronium natans*. Water crowfoot forms extensive beds along the whole length of the Dee where flow conditions are suitable. Other aquatic plants which occur within the site include intermediate water-starwort *Callitriche hamulata*, alternate-flowered water-milfoil *Myriophyllum alterniflorum* and bryophytes including *Rhynchostegium riparoides* and *Fontinalis antipyretica*. Marginal vegetation consists mainly of reed canary-grass *Phalaris arundinacea* with occasional branched bur-reed *Sparganium erectum*.

Downstream of Llangollen to Bangor-on-Dee the river shows signs of nutrient enrichment with Canadian waterweed *Elodea canadensis* becoming more prevalent. Below Bangor-on-Dee the River Dee (England) flows into the Cheshire plains and displays typical characteristics of lowland river types with shallow gradients and rich geology, with curled pondweed *Potamogeton crispus* and fennel pondweed *Potamogeton pectinatus* occurring frequently.

There is good tree cover along the banks of the River Dee and the tributaries, with the Ceiriog being tree lined on both banks along much of its length. The dominant species are alder *Alnus glutinosa* and willow *Salix* spp., with occasional ash *Fraxinus excelsior* and oak *Quercus* spp.. Where sections of the riverbank have been fenced off the vegetation tends to be dominated by bramble *Rubus fruticosus*, nettles *Urtica dioica* and other tall ruderals. Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Fallopia japonica* are increasing throughout the site.

Mammals

The otter *Lutra lutra* is well established throughout the river system, especially where appropriate bank side cover exists. Numbers have increased along the River Dee (England) in recent years, and there is a record of young being seen in 2000. Water vole *Arvicola terrestris* have been recorded on the middle and lower reaches of the River Dee.

Fish

The River Dee is recognised as one of North Wales' premier rivers for Atlantic salmon *Salmo salar*. The Mynach, Meloch and Ceiriog tributaries are the most important salmon spawning tributaries in the Dee catchment and are included in the Afon Dyfrdwy-River Dee SSSI and also in relation to the English part of Ceiriog in the River Dee (England). Other migratory fish utilising the river system include sea trout *Salmo trutta trutta*, eel *Anguilla anguilla*, river lamprey *Lampetra fluviatilis*, and sea lamprey *Petromyzon marinus*. Smelt *Osmerus eperlanus* and twaite shad *Alosa fallax* have been recorded in the section between Chester and the estuary.

The Dee also supports important populations of non-migratory fish including brown trout *Salmo trutta*, bullhead *Cottus gobio*, and brook lamprey *Lampetra planeri*. The middle and lower reaches of the Dee support a diverse coarse fish population. The river is noted for its grayling *Thymallus thymallus*.

Birds

The entire River Dee system and associated tributaries support a wide range of breeding birds, which utilise a variety of bankside habitats. Nesting habitat for the kingfisher *Alcedo atthis* and sand martin *Riparia riparia* is provided by active erosion of riverbanks. Areas of fast flowing water and bankside cover are favoured by the dipper *Cinclus cinclus* and grey wagtail *Motacilla cinerea*, whereas the yellow wagtail *Motacilla flava* and mute swan *Cygnus olor* are found along the slower flowing reaches. Populations of grey heron *Ardea cinerea*, common sandpiper *Actitis hypoleucos* and goosander *Mergus merganser* also occur on the River Dee.

Areas of the Lower Dee floodplains provide breeding grounds for waders such as the lapwing *Vanellus vanellus*, and, when flooded, provide important over-wintering sites for the pintail *Anas acuta*.

Invertebrates

The club-tailed dragonfly *Gomphus vulgatissimus* is nationally scarce and present along the lower Dee including several parts of the River Dee (England), particularly where the river is slow flowing and there is adjacent woodland habitat or bankside tree cover available for adults. This population is the most northerly in Britain and the only one within the Cheshire Area of Search.

The lower reaches of the River Dee support Britain's only known population of the stonefly *Isogenus nubecula*, which is classified as vulnerable in the Red Data Book. The nationally scarce weevil *Baris lepidii* has been recorded on sandy riverbanks along the lower Dee but has not been recorded on any other Welsh river.

Geology/Geomorphology

The River Dee Holt to Worthenbury Geological Conservation Review (GCR), previously notified as an SSSI, straddles the border and is partly located within the River Dee (England) SSSI and the Afon Dyfrdwy-River Dee SSSI.

Holt to Worthenbury (Fluvial Geomorphology)

This area of interest comprises a meandering reach of the River Dee between Holt in the north and Worthenbury in the south. It includes land in Wrexham (Wales) and Cheshire (England) and consists of some of the most spectacular and intricately developed river bends or meanders seen anywhere in Britain. The area is of national importance for studies of fluvial geomorphology.

The main features of interest within the area are: 1) the present river channel and its intricate pattern of meanders; 2) the main areas of floodplain either side of the river, for the full length of the selected reach; 3) all the visible palaeochannels (abandoned channels) located on the floodplain adjacent to the present channel; 4) the gravel and sand bars located within the modern channel and the other evidence of modern-day river processes contained within the channel; and 5) the most impressive of the remnants of ancient cliffs located towards the north-east and south-west margins of the site.

The scientific value of the site can be summarised as follows: First, the pattern and scale of the meanders are exceptional on a British scale; the range of forms from simple curves to double-headed forms, and the intricacy of the pattern developed over the whole reach is outstanding.

Second, the total landform assemblage, including the remnants of ancient river cliffs, the floodplain areas, and the present and abandoned channels, provides the basis for reconstructing the development of the river since the end of the last glaciation. Third, the abandoned channels and old meander loops (some of which were once oxbow lakes) are exceptional landforms in their own right; their pattern, location and contained sediments provide significant potential for reconstructing some of the geologically recent changes in the course of the River Dee in its long evolution during Holocene times, i.e. the last 11,500 years. Fourth, the gravel and sand bars distributed along the course of the modern channel, and the changing form of its banks and bed, bear witness to a range of important modern-day fluvial processes.

Although this part of the course of the River Dee has changed in position markedly during the Holocene, the last few hundred years have been characterised by relative channel stability. It seems likely that the banks and bed of the modern channel are now evolving in response to changing flow and sediment regimes induced by upstream regulation and other human modifications to the fluvial system. The significance of the site for studying modern-day river processes is enhanced by the tidally-influenced downstream reach. This renders the area potentially significant for investigating the effects of possible future sea-level rise on the development of the river channel, particularly in view of the long history of tidal influence and stage records (river level) at downstream locations.

This reach of the Dee is therefore of major scientific importance and, as such, is a valuable part of the heritage of Great Britain. Its national importance stems from its outstanding combination of landform, sedimentary and process evidence. Most large British rivers have been significantly channelised or straightened in their lower reaches. The Dee is exceptional in maintaining an extremely sinuous planform across the sensitive fluvial-tidal transition zone.

Other information:

The River Dee (England) abuts Afon Dyfrdwy-River Dee SSSI

The Afon Dyfrdwy-River Dee proposed SAC abuts onto the Dee Estuary SAC.

The River Dee (England) SSSI in association with the Afon Dyfrdwy-River Dee SSSI supports the following habitats and species listed in the EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. Those marked with an asterisk occur within England:

Floating vegetation of *Ranunculus* of plane, sub-mountainous rivers – Annex I

Otter *Lutra lutra** - Annex II & IV

Sea Lamprey *Petromyzon marinus** - Annex II

River Lamprey *Lampetra fluviatilis** - Annex II & V

Brook lamprey *Lampetra planeri** - Annex II

Atlantic salmon *Salmo salar** - Annex II & V

Bullhead *Cottus gobio** - Annex II

Freshwater Pearl Mussel *Margaritifera margaritifera* – Annex II & V

Grayling *Thymallus thymallus* – Annex V

The otter *Lutra lutra* and the Freshwater Pearl Mussel *Margaritifera margaritifera* are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended).

Parts of this site have been selected as a result of the former Nature Conservancy Council's Geological Conservation Review (GREGORY, K.J. 1997. *Fluvial Geomorphology of Great Britain*. Geological Conservation Review Series No. 13., Chapman & Hall), a national survey and evaluation of sites of geological and geomorphological interest.

The River Dee (England) lies within the Meres and Mosses and Oswestry Uplands Natural Areas.

Special Areas of Conservation Citations

EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora

Citation for Special Area of Conservation (SAC)

Name:	River Dee and Bala Lake
Unitary Authority/County:	Cheshire, Denbighshire, Flintshire, Gwynedd, Shropshire, Wrexham
SAC status:	English part designated on 1 April 2005 Welsh part designated on 13 December 2004
Grid reference:	SJ422503
SAC EU code:	UK0030252
Area (ha):	1,308.93
Component SSSI:	Afon Dyfrdwy (River Dee) SSSI, Llyn Tegid SSSI, River Dee (England) SSSI

Site description:

The River Dee has its source in Snowdonia at the outflow of Llyn Tegid and it includes the Ceiriog, Meloch, Tryweryn and Mynach tributaries. Its catchment contains a wide spectrum of landscape from high mountains around Bala, rugged peaks near Llangollen, steep sided wooded valleys, and the plains of Cheshire, Flintshire, north Shropshire and Wrexham. There is a tidal influence as far upstream as Farndon and high tides regularly exceed the Chester weir crest level.

The aquatic plant community includes Wirtgen's water-crowfoot *Ranunculus x bachii* and pond water-crowfoot *R. peltatus*, and also floating water-plantain *Luronium natans*. Water-crowfoot forms extensive beds along the whole length of the Dee where flow conditions are suitable. Other aquatic plants which occur within the site include intermediate water-starwort *Callitriche hamulata*, alternate-flowered water-nailfoil *Myriophyllum alterniflorum* and bryophytes including *Rhynchostegium riparioides* and *Fontinalis antipyretica*. Marginal vegetation consists mainly of reed canary-grass *Phalaris arundinacea* with occasional branched bur-reed *Sparganium erectum*.

There is good tree cover along the banks of the River Dee and the tributaries, with the Ceiriog being tree lined on both banks along much of its length. The dominant species are alder *Alnus glutinosa* and willow *Salix* spp., with occasional ash *Fraxinus excelsior* and oak *Quercus* spp. Where sections of the riverbank have been fenced off the vegetation tends to be dominated by bramble *Rubus fruticosus* agg., nettles *Urtica dioica* and other tall ruderals.

The River Dee is recognised as one of North Wales' premier rivers for Atlantic salmon *Salmo salar*. The Mynach, Meloch and Ceiriog tributaries are the most important salmon spawning tributaries in the Dee catchment. Other migratory fish utilising the river system include river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*. The Dee also supports important populations of non-migratory fish including bullhead *Cottus gobio* and brook lamprey *Lampetra planeri*. The otter *Lutra lutra* is well established throughout the river system, especially where appropriate bank side cover exists.

Qualifying habitats: The site is designated under **article 4(4)** of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Water courses of plain to montane levels with the *Ranunculus fluitans* and *Callitriche-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot)

Qualifying species: The site is designated under **article 4(4)** of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Atlantic salmon *Salmo salar*
- Brook lamprey *Lampetra planeri*
- Bullhead *Cottus gobio*
- Floating water-plantain *Luronium natans*
- Otter *Lutra lutra*
- River lamprey *Lampetra fluviatilis*
- Sea lamprey *Petromyzon marinus*

Appendix C Legislation

European Protected Species

The Ramsar Convention (1971) on Wetlands of International Importance especially as Waterfowl Habitat seeks to promote the conservation and wise use of wetlands, particularly those which support internationally significant numbers of water birds. This is achieved through the designation of Ramsar Sites.

The European Community Council Directive on the Conservation of Wild Birds (79/409/EEC) sets out general rules for the conservation of all naturally occurring wild birds, their nests, eggs and habitats. It requires member states to designate Special Protection Areas (SPAs) for protection of certain species.

The main piece of legislation relating to nature conservation in Great Britain is **The Wildlife and Countryside Act 1981 (as amended)**. This Act is supplemented by provision in **The Countryside and Rights of Way (CROW) Act 2000** and **The Natural Environment and Rural Communities Act 2006 (in England and Wales)**. This act provides varying degrees of protection for the listed species of flora and fauna, including comprehensive protection of wild birds, their nests and eggs.

The Countryside and Rights of Way Act 2000 strengthens the protection given to SSSIs. It revises the procedures for the notification of SSSIs and for the consenting of operations which may damage the special interest of a SSSI. Local authorities have a duty to take steps, consistent with the proper exercise of their functions, to further the conservation and enhancement of SSSIs. The act also strengthens the existing provisions of the Wildlife and Countryside Act 1981 for the enforcement of wildlife legislation, including a new offence of "recklessly" destroying or damaging the habitats of certain protected species.

UK wildlife is also protected under **The Conservation (Natural Habitats &c.) Regulations 1994** (which were issued under the European Communities Act 1972), through inclusion on Schedule 2. In 2017, these Regulations, together with subsequent amendments, were consolidated into **The Conservation of Habitats and Species Regulations 2017**.

The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites. The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 5. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. Licenses may be granted for a number of purposes but only after the appropriate authority is satisfied that there are no satisfactory alternatives and that such actions will have no detrimental effect on wild population of the species concerned.

The Protection of Badgers Act 1992 consolidates previous badger legislation by providing comprehensive protection for badgers and their setts, with a requirement that any authorised sett disturbance or destruction be carried out under licence.

The Hedgerows Regulations 1997 aim to protect important hedgerows in the countryside. They make it illegal to remove most countryside hedges without first notifying the local planning authority, and provide protection for 'important hedgerows'.

County Wildlife Site is a non-statutory designation used to identify high quality wildlife habitats in a county context. Local Authorities have a responsibility as part of their planning function to take account of sites of substantial nature conservation value and to consider them alongside other material planning considerations. The location of County Wildlife Sites will be included in Local Plans and Development Documents.

National Planning Policy - National Planning Policy Framework (NPPF)

Section 15 of the National Planning Policy Framework 2019 (NPPF): Conserving and enhancing the natural environment states that 'planning policies and decisions should contribute to and enhance the natural and local environment by ... minimising impacts on and providing net gains for biodiversity.'

Office of The Deputy Prime Minister ("ODPM") Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their impact within the planning system.

Paragraph 98 of Circular 06/2005 states that 'the presence of a protected species is a material consideration when a planning authority is considering a development proposal that, if carried out, would be likely to result in harm to the species or its habitat'.

Implications of legislation and policies

Without this ecological assessment, the potential developer would be unable to demonstrate due diligence in his responsibilities. Furthermore, the local planning authority would not have been provided with sufficient information for a planning decision to be made. This could result in non-determination or refusal of the application.

With legal responsibilities and planning implications, it is essential that any ecological assessment of a potential development site, including the area of this report, must determine the possible presence or absence of any protected species as part of any planning development consideration.

Bats

All bat species in Britain are protected under the Wildlife and Countryside Act 1981 through inclusion on Schedule 5. They are also protected under the Conservation (Natural Habitats &c.) Regulations 1994 (which were issued under the European Communities Act 1972), through inclusion on Schedule 2. On 30th November 2017, these Regulations, together with subsequent amendments, were consolidated into the Conservation of Habitats and Species Regulations 2017.

European protected animal species ("EPS") and their breeding sites or resting places are protected under Regulation 42. It is an offence for anyone to deliberately capture, injure or kill any such animal or to deliberately take or destroy their eggs. It is an offence to damage or destroy a breeding or resting place of such an animal. It is also an offence to have in one's possession or control, any live or dead European protected species.

The threshold above which a person will commit the offence of deliberately disturbing a wild animal of a European protected species has been raised. A person will commit an offence only if he deliberately disturbs such animals in a way as to be likely significantly to affect (a) the ability of any significant groups of animals of that species to survive, breed, or rear or nurture their young, or (b) the local distribution of abundance of that species. The existing offences under the Wildlife and Countryside Act (1981) as amended which cover obstruction of places used for shelter or protection (for example, a bat roost), disturbance and sale still apply to European protected species.

This legislation provides defences so that necessary operations may be carried out in places used by bats, provided the appropriate Statutory Nature Conservation Organisation is notified and allowed a reasonable time to advise on whether the proposed operation should be carried out and, if so, the approach to be used. The UK is a signatory to the Agreement on the Conservation of Bats in Europe, set up under the Bonn Convention. The Fundamental Obligations of Article III of this Agreement require the protection of all bats and their habitats, including the identification and protection from damage or disturbance of important feeding areas for bats.

Barn Owls

The Habitats Regulations (1994), as amended, states that a person commits an offence in the case of Barn Owl only if this species is disturbed in the breeding season. This applies equally to all those bird species listed under Schedule 1.

Breeding Birds

It is an offence to kill, injure or take any wild bird; take, damage or destroy the nest of any wild bird while that nest is in use or being built (even of "pest" species); take or destroy the eggs of any wild bird.

Great Crested Newts

Great crested newts are protected under both English and European law. It is an offence to kill, injure, disturb or take great crested newts or to damage or destroy their places of shelter, whether the animals are present or not.

Water Vole

The water vole received limited legal protection in April 1998 through its inclusion in Schedule 5 of the Wildlife & Countryside Act 1981 (as amended) for some offences. Legal protection makes it an offence to:

- intentionally kill, injure or take (capture) a water vole;
- possess or control a dead or live water vole, or any part of a water vole;
- intentionally or recklessly damage or destroy access to any structure or place which water voles use for shelter or protection or disturb Water Voles while they are using such a place;
- sell, offer for sale or advertise for sale live or dead Water Voles

Water voles, their breeding sites and resting places are protected by law. In most cases, work can be planned to avoid harming water voles.

Otters

Otters are protected under Section 9 of the Wildlife and Countryside Act 1981 (as amended) and revised by the Countryside and Rights of Way Act 2004, making it an offence to:

- intentionally kill, injure or take an otter;
- possess or control any (live or dead) otter, or any part of or anything derived from an otter;
- intentionally or recklessly damage or destroy or obstruct access to any structure or place used for shelter or protection by an otter;
- intentionally or recklessly disturb an otter while it is occupying a structure or place for that purpose;
- to sell, offer for sale, possess or transport for the purpose of sale any (live or dead) otter or part or derivative of an otter;
- to advertise for buying and selling such things.

Furthermore, otters are included on Schedule 2 of the Conservation (Habitats &c.) Regulations (1994), making it an offence to:

- deliberately to capture or kill a wild animal of a European protected species;
- deliberately to disturb any such animal;
- deliberately to take or destroy the eggs of such an animal; or
- damage or destroy a breeding site or resting place of such an animal.

Otters are also listed as a priority species on the UK and Biodiversity Action Plans.

White-Clawed Crayfish

This crayfish is listed under Annex II of the habitats directive and areas are designated as Special Areas of Conservation to protect this species. Outside of this a licence is required to capture this species. It is listed as a priority species under the Biodiversity Action Plan and is a Species of Principal Importance under section 41 of the NERC Act 2006.

Reptiles

Reptiles such as common lizard, slowworm, grass snake or adder are protected under Section 9 of the Wildlife & Countryside Act (1981) as amended. The legislation makes it illegal to deliberately or recklessly kill or injure any native reptile. This protection therefore requires that reasonable effort be made to avoid harm to reptiles during developments on land occupied by reptiles.

Badger

The Wildlife and Countryside Act (1981) and its subsequent amendment in 1985 made it an offence to take, kill, injure or ill-treat a badger. The badger gained further protection under the auspices of The Protection of Badgers Act (1992) which consolidates all former protective legislation in relation to badgers, except their inclusion on Schedule 6 of the Wildlife and Countryside Act 1981.

Under the 1992 Act, the badger sett is protected against obstruction, destruction, and damage; furthermore, the animal's access to and from the sett must not be impeded. It should be noted that the concept/definition of the sett extends beyond the main sett to include annexe, subsidiary and outlying setts. However, although the badger and its sett are protected (including access to the sett), the wider habitat and foraging ground is not.

Dormice

Dormice are protected from being killed, injured, captured or disturbed and their resting and breeding places should not be damaged or destroyed.

Appendix D

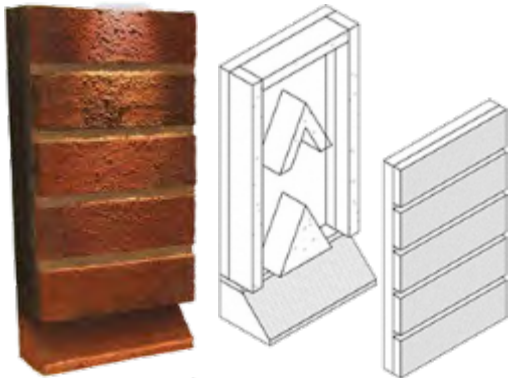
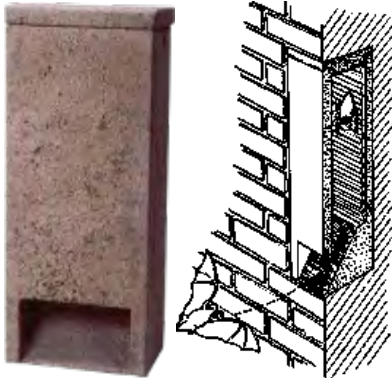
Plant species recorded on site

English name	Scientific name
Scientific name	Common name
<i>Acer campestre</i>	Field maple
<i>Acer pseudoplatanus</i>	Sycamore
<i>Agrostis stolonifera</i>	Creeping bent
<i>Quercus robur</i>	Pedunculate Oak
<i>Fraxinus excelsior</i>	Ash
<i>Alnus glutinosa</i>	Alder
<i>Heracleum sphondylium</i>	Hogweed
<i>Cirsium vulgare</i>	Spear thistle
<i>Corylus avellana</i>	Hazel
<i>Bromus sp.</i>	Brome grass
<i>Arrhenatherum elatius</i>	False oat grass
<i>Holcus lanatus</i>	Yorkshire fog
<i>Cirsium vulgare</i>	Spear thistle
<i>Cirsium arvense</i>	Creeping thistle
<i>Vicia sativa</i>	Common vetch
<i>Chamaenerion angustifolium</i>	Rosebay willow herb
<i>Crataegus monogyna</i>	Hawthorn
<i>Dactylis glomerata</i>	Cock's-foot
<i>Fraxinus excelsior</i>	Ash
<i>Lolium perenne</i>	Perennial rye-grass
<i>Phleum pratense</i>	Timothy
<i>Dactylis glomerata</i>	Cocks'foot
<i>Rumex obtusifolius</i>	Broad-leaved dock
<i>Artemisia vulgaris</i>	Mugwort
<i>Senecio vulgaris</i>	Groundsel
<i>Ranunculus repens</i>	Creeping buttercup
<i>Galium aparine</i>	Common cleavers
<i>Plantago lanceolata</i>	Ribwort plantain
<i>Poa annua</i>	Meadow grass
<i>Prunus spinosa</i>	Blackthorn
<i>Rosa canina</i>	Dog rose
<i>Rubus fruticosus agg</i>	Bramble
<i>Salix caprea</i>	Goat willow
<i>Sambucus nigra</i>	Elder
<i>Taraxum officinale agg</i>	Dandelion
<i>Agrostis stolonifera</i>	Creeping bent
<i>Anthriscus sylvestris</i>	Cow parsley
<i>Urtica dioica</i>	Common nettle
<i>Smyrniolus olusatrum</i>	Alexanders
<i>Impatiens glandulifera</i>	Himalayan Balsam
<i>Tussilago farfara</i>	Colt's-foot
<i>Alliaria petiolata</i>	Garlic mustard

Appendix E

Examples of bat and bird boxes

(images sourced from www.nhbs.com, www.habibat.co.uk and www.manthorpe.co.uk)

Integrated bat box Habibat Bat Box 	Integrated bat box 1FR Schwegler Bat Tube 
Standalone bat box 2F Schwegler Bat Box (General purpose) 	Standalone bat box 1FF Schwegler Bat Box with built-in wooden rear panel 

Recommendations for installing bat boxes:

(Sourced from Bat Conservation Trust www.bct.org)

Ideally, several boxes should be put up facing in different directions to provide a range of conditions.

Locate boxes:

- Where bats are known to feed close to hedges and tree lines (some bats use a tree line or hedgerow for navigation, putting boxes near these features may help the bats find the box).
- On trees: boxes should be placed on the trunk of a mature tree, where there is a clear flight line/accessible entrance.
- On buildings: boxes should be placed as close to the eaves as possible.
- As high as possible (ideally, at least 3 to 4m above the ground, where safe installation is possible).
- In sunny places, sheltered from strong winds (usually between south-west and south-east).

Make sure the boxes are secured.

Boxes can be installed on trees using adjustable ties to avoid damaging the trees. Otherwise, timber screw bolts or nails can be used. Aluminium alloy nails are less likely to damage saws and chipping machinery.

Bats need time to find and explore new homes, and it may be several months or even years before boxes have residents. Once bats find a place they want to live they can return over and over again. Droppings on the landing area, urine stains around the lower parts of the box and chittering noises from inside on warm afternoons and evenings are signs of occupation.

Small bird nesting box 1B Schwegler Nest Box 	Small bird nesting box 2H Schwegler Robin Box 
Small bird nesting box 2GR Schwegler Nest Box 	Small bird nesting box 3SV Schwegler Nest Box 
Small bird nesting box Kestrel Nest Box 	Small bird nesting box Schwegler Kestrel Nest Box 28 

Recommendations for installing bird boxes:

(Sourced from British Trust for Ornithology www.bto.org and Manthorpe www.manthorpe.co.uk)

The highest priority when siting a nest box must be to provide a safe and comfortable environment in which birds can nest successfully.

Tips for putting up a nest box:

- Boxes should be sited 1-3m from the ground, ideally on tree trunks but can be placed on the side of a shed or wall. Avoid areas where foliage obscures the entrance hole.
- Don't place boxes too close to another nest box of the same type, as this may promote aggressive behaviour between neighbours.
- Shelter your nest box from prevailing wind, rain and strong sunlight. The box should face between north and east, and angled vertically or slightly downwards to prevent rain entering.
- Make sure cats cannot get into the box.
- Keep nest box away from bird feeders.
- Use galvanized or stainless steel screws or nails. If fixing boxes to trees, galvanised wire can be used to tie the box to the trunk or hang it from a branch. Make sure to regularly inspect these fittings (every two or three years) to ensure the box remains securely attached.

Tips for putting up kestrel boxes:

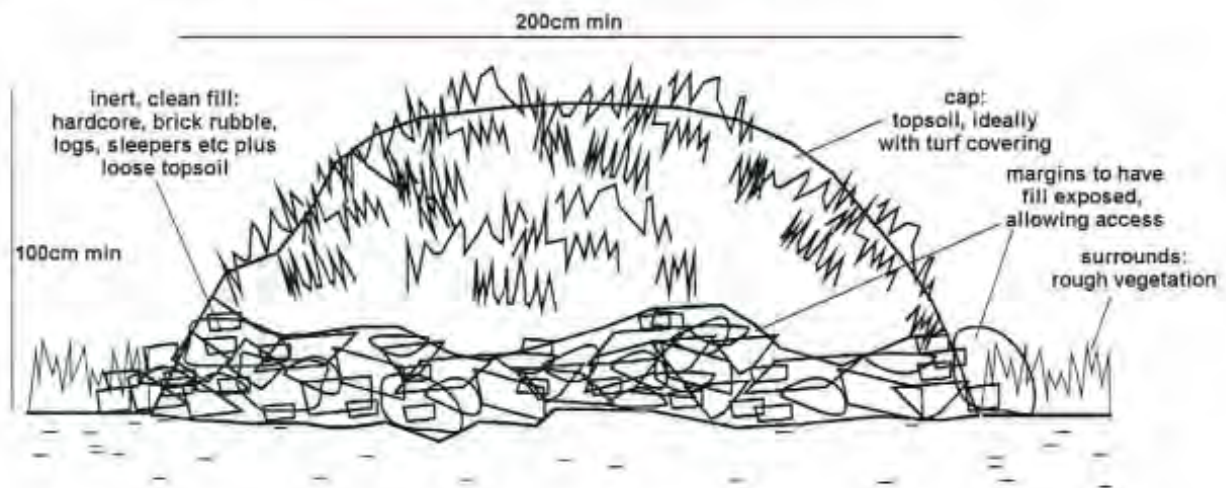
- The box should be installed on a building or tree in open farmland, on an isolated hedgerow or along the edge of a woodland.
- Boxes should be sited at least 5m from the ground, with a clear flight-path for entry and exit.
- Where possible, install boxes facing southeast or away from the prevailing wind.

Appendix F

Amphibian and reptile artificial hibernaculum design

Figure 3: Suggested hibernaculum design

This design mimics artificial and natural conditions in which great crested newts have frequently been found overwintering. Dimensions should not be below 2m length x 1m width x 1m height. The illustrated design would be suitable for locating on an impermeable substrate. On free-draining substrates, the design is largely similar but the bulk of the fill is sited in an excavated depression in the ground. Hibernacula should ideally be positioned across a site, both close to and distant from breeding ponds, always in suitable terrestrial habitat and above the flood-line.



Source: English Nature (2001) *Great Crested Newt Mitigation Guidelines*, Peterborough.

Appendix G

Examples of hedgehog friendly fencing

(images sourced from www.quercusfencing.com and www.jackson-fencing.co.uk)

Quercus Fencing Hedgehog friendly oak woven fencing panels 	Jacksons-Fencing Hedgehog friendly gravel board for use with slotted posts 
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Recommendations for installing hedgehog friendly fencing:

(Sourced from Hedgehog Street www.hedgehogstreet.org)

A hedgehog friendly fence should have a gap measuring at least 13cm by 13cm in the gravel board. These gaps allow any hedgehog to pass through but are too small for nearly all pets.

At least one hedgehog friendly fence panel should be located on each side of your garden, to provide unimpeded access.

Almost all fencing materials can be made hedgehog friendly, but may require DIY adaptations. Please note that some concrete gravel boards contain metal rods running along the length of the boards to provide strength and rigidity, and cannot be cut. To overcome this, a gap can be left between the gravel board and post to provide the required gap.

Appendix H

Native species suitable for planting and sowing

Plants should be obtained from specialist nurseries and preferably be of local genetic stock.

Key: (f) – fruit and berry species; (e) – evergreen species; (se) semi-evergreen species; (d) – deciduous species

Trees	
Alder (d)	<i>Alnus glutinosa</i>
Apples (f; d)	<i>Malus spp.</i> (local varieties)
Ash (d)	<i>Fraxinus excelsior</i>
Beech (d)	<i>Fagus sylvatica</i>
Bird cherry (f; d)	<i>Prunus padus</i>
Elder (f; d)	<i>Sambucus nigra</i>
Elm (d)	<i>Ulmus procera</i>
Field maple (d)	<i>Acer campestre</i>
Pedunculate oak (d)	<i>Quercus robur</i>
Rowan (f; d)	<i>Sorbus aucuparia</i>
Pears (f; d)	<i>Pyrus spp.</i>
Silver birch (d)	<i>Betula pendula</i>
Small-leaved lime (d)	<i>Tilia cordata</i>
White willow (d)	<i>Salix alba</i>
Wild cherry (f; d)	<i>Prunus avium</i>
Walnut (d)	<i>Juglans regia</i>

Shrubs	
Blackthorn (f; d)	<i>Prunus spinosa</i>
Buckthorn (f; d)	<i>Rhamnus catharticus</i>
Crab apple (f; d)	<i>Malus sylvestris</i>
Dog rose (f; d)	<i>Rosa canina</i>
Dogwood (f; d)	<i>Cornus sanguinea</i>
Field maple (d)	<i>Acer campestre</i>
Guelder-rose (f; d)	<i>Viburnum opulus</i>
Hawthorn (f; d)	<i>Crataegus monogyna</i>
Hazel (d)	<i>Corylus avellana</i>
Holly (e)	<i>Ilex aquifolium</i>
Honeysuckle (f; d)	<i>Lonicera periclymenum</i>
Spindle (f; d)	<i>Euonymus europaeus</i>
Wild privet (f; se)	<i>Ligustrum vulgare</i>
Yew (f; e)	<i>Taxus baccata</i>

Flowering plants	
Bird's-foot trefoil	<i>Lotus corniculatus</i>
Black knapweed	<i>Centaurea nigra</i>
Common cat's-ear	<i>Hypochaeris radicata</i>
Common sorrel	<i>Rumex acetosa</i>
Common vetch	<i>Vicia sativa</i>
Cowslip	<i>Primula veris</i>
Field scabious	<i>Knautia arvensis</i>
Foxglove	<i>Digitalis purpurea</i>
Lady's bedstraw	<i>Galium verum</i>
Meadow buttercup	<i>Ranunculus acris</i>
Meadow vetchling	<i>Lathyrus pratensis</i>
Oxeye daisy	<i>Leucanthemum vulgare</i>
Primrose	<i>Primula vulgaris</i>
Red clover	<i>Trifolium pratense</i>
Selfheal	<i>Prunella vulgaris</i>
Sweet violet	<i>Viola odorata</i>
Wild daffodil	<i>Narcissus pseudonarcissus</i>
Yarrow	<i>Achillea millefolium</i>

Grasses	
Common bent	<i>Agrostis capillaris</i>
Crested dog's-tail	<i>Cynosurus cristatus</i>
Meadow fescue	<i>Festuca pratensis</i>
Red fescue	<i>Festuca rubra</i>
Rough meadow-grass	<i>Poa trivialis</i>
Small timothy	<i>Phleum bertolonii</i>
Smooth meadow-grass	<i>Poa pratensis</i>
Sweet vernal-grass	<i>Anthoxanthum odoratum</i>
Yellow oat-grass	<i>Trisetum flavescens</i>

Appendix I

Impact assessment methodology

The impact assessment has been carried out following the “Guidelines for Ecological Impact Assessment” produced by the (now Chartered) Institute of Ecology and Environmental Management (2019).

The magnitude, duration, reversibility, probability of occurrence, and geographic scale of importance of all potential impacts are to be evaluated by professional judgments based on the available information.

The CIEEM assessment guidelines state that, where possible, the magnitude of impact should be quantified, such as the number of animals estimated to be affected by a given activity, or the percentage of an area to be disturbed or destroyed. When necessarily defined in qualified terms, the impact magnitude of effect categories and criteria are defined per Byron (2000) as:

Magnitude of impact	Terms
Major negative	Has a harmful effect on the integrity of a conservation site or the conservation status of a population of a species within a defined geographical area (e.g., fundamentally reduces the capacity to support wildlife for the entirety of a conservation site, or compromises the persistence of a species' population).
Intermediate negative	Has no adverse effect on the integrity of a conservation site or the conservation status of a species' population, but does have an important adverse effect in terms of achieving certain ecological objectives (e.g., sustaining target habitat conditions and levels of wildlife for a conservation site or maintaining population growth for a species).
Minor negative	Some minor detrimental effect is evident, but not to the extent of the above.
Neutral	Has no predictable effect.
Positive	Has a net positive effect on a wildlife species.

The probability of a potential impact occurring has been categorised as:

Probability	Measure
Certain/near-certain	Probability of occurrence estimated at 95% chance or higher
Probable	Probability of occurrence estimated above 50% but below 95%;
Unlikely	Probability of occurrence estimated above 5% but less than 50%;
Extremely unlikely	Probability of occurrence estimated at less than 5%.

The predicted spatial importance of an effect is categorized following the scale provided by the CIEEM:

- International;
- National;
- Regional;
- County;
- District;
- Local/parish;
- and, Site level only.

For the purposes of this study and following the CIEEM guidelines, an ecologically significant impact is that which affects the integrity of a defined site or ecosystem and/or the conservation status of habitats or species populations within a defined geographical area.

‘Integrity’ in this technical sense is defined within the CIEEM guidelines as “The coherence of [a site’s] ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified.”

Within the CIEEM guidelines ‘conservation status’ is defined as: “...for species, conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographical area.”

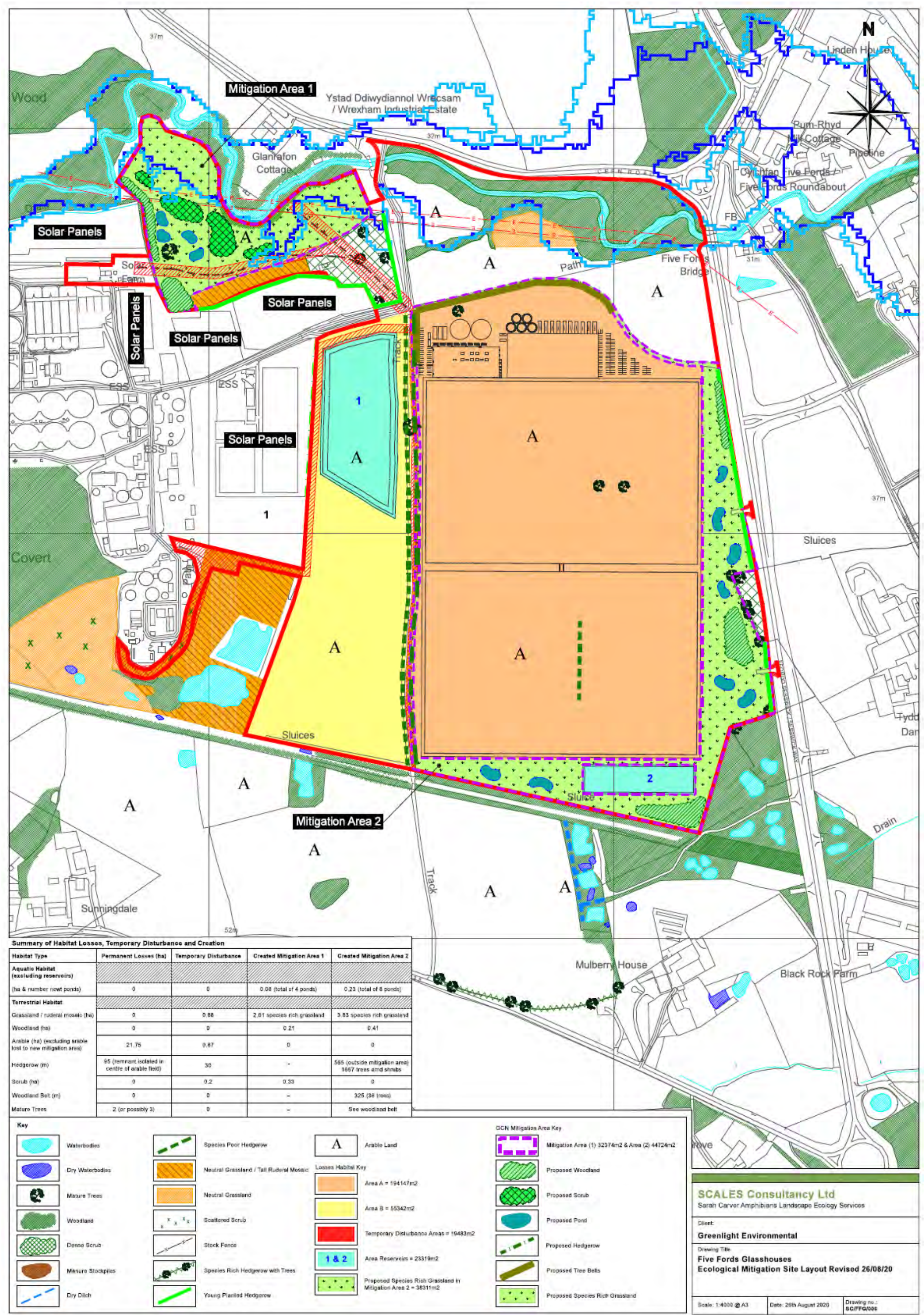
For the purposes of this assessment, significance will only be attached to negative impacts of either intermediate or major magnitude, generally provided the impact is probable at a local/parish scale or greater. For a very high-value receptor, major negative effects which are considered unlikely (but with elevated uncertainty) might also be judged significant. Only receptors judged to be of local/parish value or greater are carried forward for assessment.

Appendix J

Proposed plans and GCN receptor area

Document titled 'Ecological Mitigation Site Layout - Wrexham 200826'

(SCALES Consultancy Ltd., 2020a)



Appendix K

Phase 1 habitat map



Appendix L

Target notes

Target note number	Comments
T1	An animal track possibly badger on the southern boundary.
T2	This field track and public footpath is bordered by a hawthorn hedge on the west and a strip of ruderal rough grassland to the east.
T3	This is a virtually intact hawthorn hedge with occasional elder on the west of a track.
T4	An arable field of recently planted crop.
T5	An animal track possibly badger on the western boundary.
T6	River Clywedog with stone/shingle bed.
T7	This is a small brick building within a fenced area with surrounding rough grassland and scrub.
T8	Stockpiles of manure and a mature oak tree.
T9	This is a fairly young planted hedgerow with a wide variety of species.
T10	An old species rich hedge with mature field maple.
T11	Two mature Pedunculate oak trees, the westerly of which in particular displayed considerable dead wood.
T12	A mature sycamore tree on the track.

Appendix M Site Photographs



Photo 1, General View of Main Arable compartment view south.



Photo 2, General View of Main Arable compartment view south west.



Photo 3, General View of Main Arable compartment view north.



Photo 4, General View of Main Arable compartment view north east.



Photo 5, Mature oak within eastern red line boundary by Sesswick Road.



Photo 6, Mature oak outside boundary south east.



Photo 7, Remnant hedge in arable field.



Photo 8, Possible badger run TN7 on southern boundary.



Photo 9, TN2 Track and hedge aligned north south in arable pasture.



Photo 10, TN2 hedge and track aligned north south in arable pasture.



Photo 11, TN4 possibly wheat - field looking north.



Photo 12, River TN6.



Photo 13, TN7 looking south – arable field and brick building.



Photo 14, TN8 manure stockpiles and mature oak.



Photo 15, Mature oaks in centre of arable field looking south TN11.



Photo 16, TN9 planted hedge on eastern boundary.



Photo 17, TN10 Species rich hedge and mature oak.



Photo 18, Species rich hedge and mature trees to the south near the A525.



Photo 19, TN12 mature sycamore along the track.

Appendix N

eDNA results



Folio No: E7547
 Report No: 1
 Purchase Order: Etienne Swarts
 Client: GREENLIGHT
 Contact: Etienne, Sarah Carver

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 28/05/2020
 Date Reported: 04/06/2020
 Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
2761	Pond 20, Five Fords		Pass	Pass	Pass	Negative	0
2762	Pond 17, Five Fords		Pass	Pass	Pass	Positive	2
2763	Pond 3, Five Fords		Pass	Pass	Pass	Positive	8
2765	Pond 9, Five Fords		Pass	Pass	Pass	Positive	4
2767	Pond 18, Five Fords		Pass	Pass	Pass	Positive	2
2769	Pond 4, Five Fords		Pass	Pass	Pass	Positive	5
2771	Pond 2 (2), Five Fords		Pass	Pass	Pass	Positive	1



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2772	Pond 19, Five Fords		Pass	Pass	Pass	Negative	0
2773	Pond 5, Five Fords		Pass	Pass	Pass	Negative	0
2774	Pond 6, Five Fords		Pass	Pass	Pass	Positive	2
2775	Pond 26, Five Fords		Pass	Pass	Pass	Positive	1
2777	Pond 22, Five Fords		Pass	Pass	Pass	Negative	0
2778	Pond 23, Five Fords		Pass	Pass	Pass	Positive	1
2779	Pond 8, Five Fords		Pass	Pass	Pass	Positive	5
2780	Pond 7, Five Fords		Pass	Pass	Pass	Positive	12

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Sarah Evans

Approved by: Chris Troth

METHODOLOGY

The samples detailed above have been analysed for the presence of GCN eDNA following the protocol stated in DEFRA WC1067 'Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5.' (Biggs et al. 2014). Each of the 6 sub-sample tubes are first centrifuged and pooled together into a single sample which then undergoes DNA extraction. The extracted sample is then analysed using real time PCR (qPCR), which uses species-specific molecular markers to amplify GCN DNA within a sample. These markers are unique to GCN DNA, meaning that there should be no detection of closely related species.

If GCN DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If GCN DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd is ISO9001 accredited and participate in Natural England's proficiency testing scheme for GCN eDNA testing. We also carry out regular inter-laboratory checks on accuracy of results as part of our quality control procedures.

INTERPRETATION OF RESULTS



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Page 2 of 3



SIC:	Sample Integrity Check [Pass/Fail] When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.
DC:	Degradation Check [Pass/Fail] Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample between the date it was made to the date of analysis. Degradation of the spiked DNA marker may lead indicate a risk of false negative results.
IC:	Inhibition Check [Pass/Fail] The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.
Result:	Presence of GCN eDNA [Positive/Negative/Inconclusive] Positive: GCN DNA was identified within the sample, indicative of GCN presence within the sampling location at the time the sample was taken or within the recent past at the sampling location. Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for GCN presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative GCN presence. Negative: GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of GCN absence, however, does not exclude the potential for GCN presence below the limit of detection.



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Page 3 of 3



Folio No: E7624
Report No: 1
Purchase Order: Étienne
Client: GREENLIGHT
Contact: Sarah Carver

TECHNICAL REPORT

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SUMMARY

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RESULTS

Date sample received at Laboratory: 04/06/2020
Date Reported: 11/06/2020
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
2768	Pond 25, Five Fords		Pass	Pass	Pass	Positive	5

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chris Troth

Approved by: Sarah Evans



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Page 1 of 2



METHODOLOGY

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Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

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INTERPRETATION OF RESULTS

SIC:	Sample Integrity Check [Pass/Fail] When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.
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Appendix O

Pond descriptions

Numbers/letters in brackets after the Pond number are the name/code assigned to the pond according to Middlemarch pond numbering system.

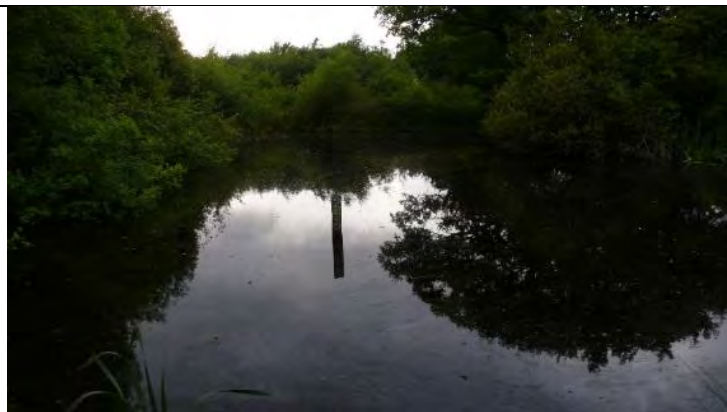
Pond 1 – Understood to be a water attenuation lagoon constructed as part of the development for the new Sesswick Road.

No photo

Pond 2 (N1) – A medium pond 280m² surrounded by dense willow including coppiced goat willow *Salix cinerea*. Reedmace *Typha latifolia*, and Rush *Juncus sp.* Water forget-me-not *Myosotis scorpioides* present. Depth not known.



Pond 3 (X2) – A large old pond of approximately 550m² in size, heavily shaded by mature woodland with little marginal or aquatic vegetation. Some reedmace, broad-leaved willow herb, bittersweet *Solanum dulcamara*, horsetail *Equisetum sp.* and broad-leaved pondweed *Potamogeton natans* were present.



Pond 4 (N4 on marker post) - A medium pond approximately 230m² with well-established marginal and aquatic vegetation comprising mainly of common reedmace. Broad-leaved pondweed was present in the open water areas. Fool's watercress *Apium nodiflorum*, Rush species and sedges were present. Pond was surrounded by dense goat willow scrub. Pond connected by a shallow ditch to pond 5.



Pond 5 (N2 on marker post) – A pond very similar to pond 4 about 320m². Pond connected by a shallow ditch to pond 4



Pond 6 (N3 on marker post) – 360m² approximately. Pond surrounded by dense goat willow with reedmace, broad-leaved pondweed and rush. Pond did not appear to be particularly deep.



Pond 7 (X1) – a small pond with 150m² open water but 320m² in total surrounded by dense bramble with some mature oak trees. Reedmace was present and much of the surface was covered in duckweed *Lemna minor*. Some bittersweet was present on the edges. The southern edge was more open water with reedmace dominating the northern end.



Pond 8 (N5) – approximately 125m². possibly a mitigation pond for the road Marginal and aquatic vegetation includes reedmace and broad-leaved pondweed and covered approximately 70% of the water surface. Some rush and large bittercress *Cardamine amara* was present on the margins.



Pond 9 (N6) – A pond about 200m², possibly a mitigation pond for the road, estimated to be approximately 1m deep with 70% vegetation cover. Plants included Broad leaved pond weed, reedmace, large bittercress, fool's watercress.



Pond 16 - A dry farm pond.



Pond 17 (X5 on marker post). 700m² approximately.
An old deep shaded pond surrounded by mature woodland. A large proportion of the surface had a covering of duckweed. Rush sp., horsetail, reedmace and bittersweet were recorded.



Pond 18 (X7) - 500m² approximately.
An old deep shaded pond surrounded by mature woodland. A large proportion of the surface had a covering of duckweed. Very little aquatic or marginal vegetation. Some reedmace was present. Smaller dry pools were present to the north and south. The southern may contain water at higher water levels.



Pond 19 (X9 on marker post) – 350m² approximately. A partially shaded old pond within mature woodland. Vegetation included Willowherb *Epilobium sp.*, Horsetail, rush, broad-leaved pondweed and water starwort *Callitriche paulustris*.



Pond 20 (X11) - A large pond with silty shallow edges 800m² approximately. Situated in dense mature woodland. Some limited vegetation included reedmace and bittersweet.



Pond 21 – A small shallow pond in a horse grazed field with Reedmace. Assessed from a distance on the opposite side of the fence to the north. 150m² approximately.



Pond 22 – A large lagoon 3000m² approximately within the Welsh Water property with shallow silty edges and willow on the banks. A fringe of dense Reedmace was present on the shoreline with frequent Gipsywort *Lycopus europaeus* and occasional bittersweet.



Pond 23 – A large engineered raised lagoon 2500m² approximately within the Welsh Water property. Possibly deep with reedmace. Nettle and dense bramble dominate the banks and Gipsywort and *Epilobium sp.* are frequent. Coot *fulica atra* was present. Anecdotal evidence of presence of fish. Swallows were skimming over the surface.



Pond 24 – A very small dry 'mitigation' pond. Bare exposed banks.



Pond 25 – A very small 'mitigation' pond with reedmace as the dominant plant and occasional rush species. Approximately 50m² with bare exposed banks.



Pond 26 – A fairly small 'mitigation' pond. Rush species, reedmace and Ragged robin *Lychnis flos-cuculi* were present. Approximately 100m².



Appendix P

Bat activity – static survey

10.1. The location of the static detectors are shown in Figure 2.



Figure 2

The site boundary and location of the static detectors are indicated by the dashed red line and numbers respectively.

Image © Google, date accessed 27/08/20

10.2. The survey conditions are indicated in Table 10 below:

Date	Temperature at sunset	Wind (mph scale)	Percipitation overnight
30/06/20	15°C	4	Scattered showers
01/07/20	14°C	7	Scattered showers
02/07/20	13°C	11	Dry
03/07/20	17°C	12	Dry
04/07/20	15°C	7	Dry
05/07/20	13°C	19	Dry
06/07/20	13°C	6	Dry
07/07/20	13°C	6	Light rain
08/07/20	13°C	6	Light rain
09/07/20	13°C	6	Dry
21/07/20	13°C	4	Dry
22/07/20	15°C	5	Dry
23/07/20	17°C	4	Dry
24/07/20	18°C	9	Dry
25/07/20	17°C	9	Scattered showers
26/07/20	15°C	16	Scattered showers
27/07/20	13°C	12	Dry
28/07/20	14°C	6	Dry
29/07/20	15°C	6	Dry
30/07/20	24°C	9	Dry
18/08/20	15°C	9	Dry
19/08/20	18°C	11	Scattered showers
20/08/20	16°C	17	Dry
21/08/20	16°C	14	Scattered showers
22/08/20	15°C	7	Dry
23/08/20	13°C	6	Dry
24/08/20	15°C	6	Dry

Table 11, static bat activity survey conditions.

- 10.3. Static detectors recorded a **low** to **high** level of bat foraging and commuting activity from common pipistrelles, soprano pipistrelles, brown long-eared, noctules, *Nyctalus sp./Eptesicus sp.*, *Myotis sp.* and unidentified pipistrelles.
- 10.4. Emergence times can be used to give an indication of roosting sites within the local area, as species often emerge at different times. For example, noctules are often recorded emerging up to 10 minutes after sunset, common pipistrelles up to 35 minutes after sunset and brown long-eared bats up to 60 minutes after sunset.
- 10.5. The static detectors indicated common pipistrelles, soprano pipistrelles, noctules and *Myotis sp.* around their typical emergence times, indicating several potential roosts in the near vicinity.

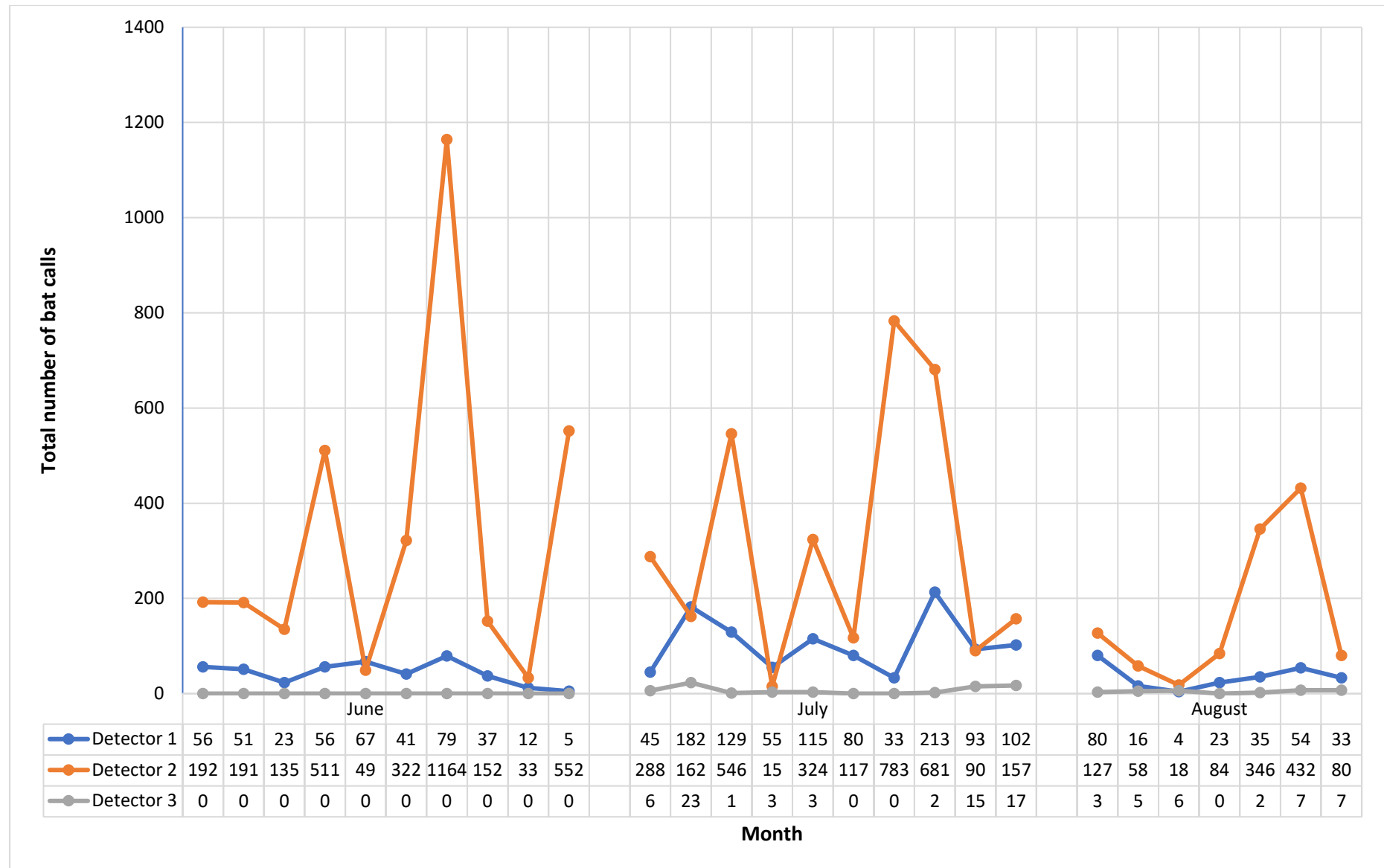


Figure 6, Total number of bat calls per detector/night/month from static detectors.

- 10.6. The number of bat calls between the three static detectors was fairly consistent throughout the surveys, indicating that bats interact with the site in the same manner over different months.
- 10.7. Detectors one and two indicate the hedgerows in these areas are used for a mixture of foraging and commuting, with the latter of higher importance being used on a more regular basis. Although detector three recorded minimal activity, bats were observed to be commuting and foraging along the disused railway to the south of the site, rather than along the eastern boundary during the transect surveys.

Species	% of total calls		
	June	July	August
Brown long-eared	0.21%	0.14%	0.21%
Common pipistrelle	4.67%	6.61%	13.66%
<i>Myotis sp.</i>	3.84%	1.59%	8.03%
Noctule	4.10%	8.46%	3.80%
<i>Nyctalus/Eptesicus sp.</i>	0.00%	0.07%	0.00%
Pipistrelle	0.35%	0.65%	0.49%
Soprano pipistrelle	86.83%	82.48%	73.80%

Table 12, species composition as a percentage of total bat calls per month.

- 10.8. Although the species composition of bat activity was dominated by soprano pipistrelles, a relatively large proportion of calls were from rarer species (e.g. *Myotis sp.*) which are normally under recorded due to their call characteristics.
- 10.9. The number of species recorded indicates the site and adjacent habitats are of high importance for a variety of bat species.

Appendix Q

Bat activity – transect survey report

Document titled 'Bat Activity Survey Report – Wrexham 200826' (Gritstone Ecology, 2020b).

Appendix R

Aerial inspection survey report

Document titled 'Aerial Inspection Report – Wrexham 200826' (Gritstone Ecology, 2020a).

Appendix S

Bat presence/absence survey report

Document titled 'Bat Presence - Absence Survey Report – Wrexham 200826' (Gritstone Ecology, 2020c).

Appendix T

Bird survey report

Document titled 'Bird Survey Report – Wrexham 200826' (Marches Ecology, 2020).

Appendix U

GCN survey report

Document titled 'GCN Survey Report – Wrexham 200826' (Greenlight, 2020).

Appendix V

Reptile survey report

Document titled 'Reptile Survey Report – Wrexham 200826' (SCALES Consultancy Limited, 2020b).